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This Month's Cover

In the main dairying districts of New Zealand hay and silage made from surplus pasture are the principal supplementary feeds for stock when grazing is short. This month's cover, which has been reproduced from a colour photograph by National Publicity Studios, shows a group of farmers at Broadlands (between Rotorua and Taupo) collecting material with buckrakes for a silage stack. In recent years methods of stacking silage have been considerably modified to suit the efficient operation of buckrakes, and long wedge or bun stacks built on flat or sloping ground have become a feature of the landscape in dairying districts. The buckrake is particularly suitable also for the filling of silage trenches.

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Sulphur Investigations in North Otago

By W. R. LOBB, Instructor in Agriculture, Department of Agriculture, Oamaru

A DESCRIPTION of research work with sulphur as a fertiliser in North Otago appeared on page 559 in the June 1953 issue of the "Journal of Agriculture". Three trials then in progress on a certain soil type indicated that sulphur might be of some significance in promoting plant growth. One trial was on the property of Mr. W. S. Perry, Totara, and the other two were on the properties of Messrs. W. G. Spite, Alma, and B. R. Milmine, Teschemakers. These trials were laid down in July 1952 and there has been no retreatment. All have shown marked sulphur responses and these are still apparent. This initial success has been followed by further trials, and a summary of the position to date is given in this article.

IN most literature on the essential major and minor elements required by plants sulphur is referred to as a major element. In general it can be assumed that it is required in fairly large quantities by plants; in fact plants contain almost equal amounts of sulphur and phosphorus. It may be surprising, therefore, that sulphur has not received more attention as a fertiliser. The reasons for this may be that most soils may supply sufficient sulphur for plant growth, that sulphur is supplied in appreciable amounts from the atmosphere, especially near industrial areas, and that most fertiliser materials used have in any case provided sulphur, thus masking any possible sulphur deficiency.

HEADING PHOTOGRAPH: Despite their low rainfall, some of the steeply rolling hills and easy downlands in North Otago produce heavy crops of wheat, barley, potatoes, and vegetables. These soils are rightly considered fertile, but it is on them that sulphur responses are now being demonstrated.

The main emphasis to date has been on such nutrients as phosphorus, potassium, and nitrogen, and common fertilisers supplying these nutrients are superphosphate, sulphate of potash, and sulphate of ammonia, all of which contain sulphur. In trace element work many elements have also been used as sulphates; for example, copper, iron, magnesium, and manganese sulphate. Such factors have hindered the detection of soils naturally deficient in sulphur.

Sulphur and various sulphates have been widely used to make soil more acid. The use of sulphur and sulphate of iron to render soils suitable for the growing of such shrubs as rhododendrons, azaleas, and heaths is one example of this; the use of continuous applications of sulphate of ammonia on lawns and playing surfaces to induce acid soil conditions is another. However, the making of soils more acid by sulphur is unlikely to be the reason for plant responses to sulphur in North Otago.

Stimulation of Legume Growth

The effect of sulphur in the pasture trials in North Otago is almost wholly one of stimulating legume growth in much the same way as molybdenum has done on certain soils. As with molybdenum and nitrogen deficiencies, plants suffering from sulphur deficiency show symptoms of general yellowing, reduced growth, small leaves, and thin stems. In molybdenum deficiency it is considered that there is no reduction in the number of nodules on the roots of legumes, whereas in sulphur deficiency the number of nodules is reduced.

Total sulphur in a soil may not be a reliable guide to deficiency. In the soils of three of the trial areas the total percentage of sulphur was determined as 0.042, 0.065, and 0.057, all of which would be in the range normally found in soils. The rate of release of sulphur from organic combination may be the critical factor.

The soil tests on the areas where the best responses have been obtained are interesting and indicate high pH, calcium, phosphorus, and potash. The following table gives a comparison

between the numerical rating of normal satisfactory levels of pH, calcium, potassium, and phosphoric acid and the ratings of levels found in nine responsive trials.

Normal satisfactory level	pH 6.0	Calcium 10	Potassium 10	Phosphoric acid 10 to 15
Trial 1 ..	6.7	*20	*40	72
2 ..	6.5	19	30	31
3 ..	6.5	*20	27	26
4 ..	6.7	*20	16	17
5 ..	6.9	*20	15	24
6 ..	7.3	*20	30	36
7 ..	6.7	18.5	22	21
8 ..	7.2	*20	*40	37
9 ..	7.6	*20	*40	160

* Actual figures were greater than those shown.

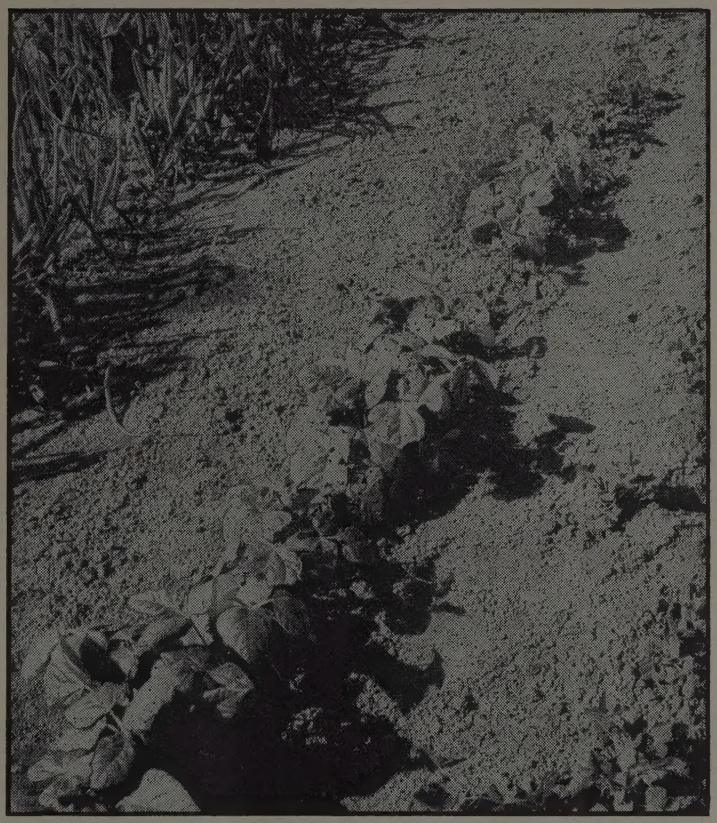
The possibility that sulphur deficiency may be diagnosed through plant analysis is indicated by the following comparison of percentages of sulphur in leaves of chou moellier and soft turnips taken from suspected deficient crops in the district and leaves of similar crops grown where no sulphur deficiencies are apparent.

PERCENTAGE OF SULPHUR IN DRY MATTER OF LEAVES

	Suspected deficient per cent.	Apparently normal per cent.
Chou moellier ..	0.17 to 0.27	0.96 to 1.38
Soft turnip ..	0.18 to 0.19	0.69 to 0.99

Work on Tarry Soils

Last season's work was concerned mainly with confirming sulphur deficiencies on the tarry soils (Waiareka complex) of the districts. From results obtained these have now been confirmed, but it is by no means certain that this complex is the only type where sulphur may be of importance. One trial on an entirely different soil type has shown a response to sulphur and also to copper sulphate. Work will therefore have to be extended to cover other types and in this case to check on copper, as other sulphates (such as magnesium, iron, and manganese) did not give responses to the degree that copper did.



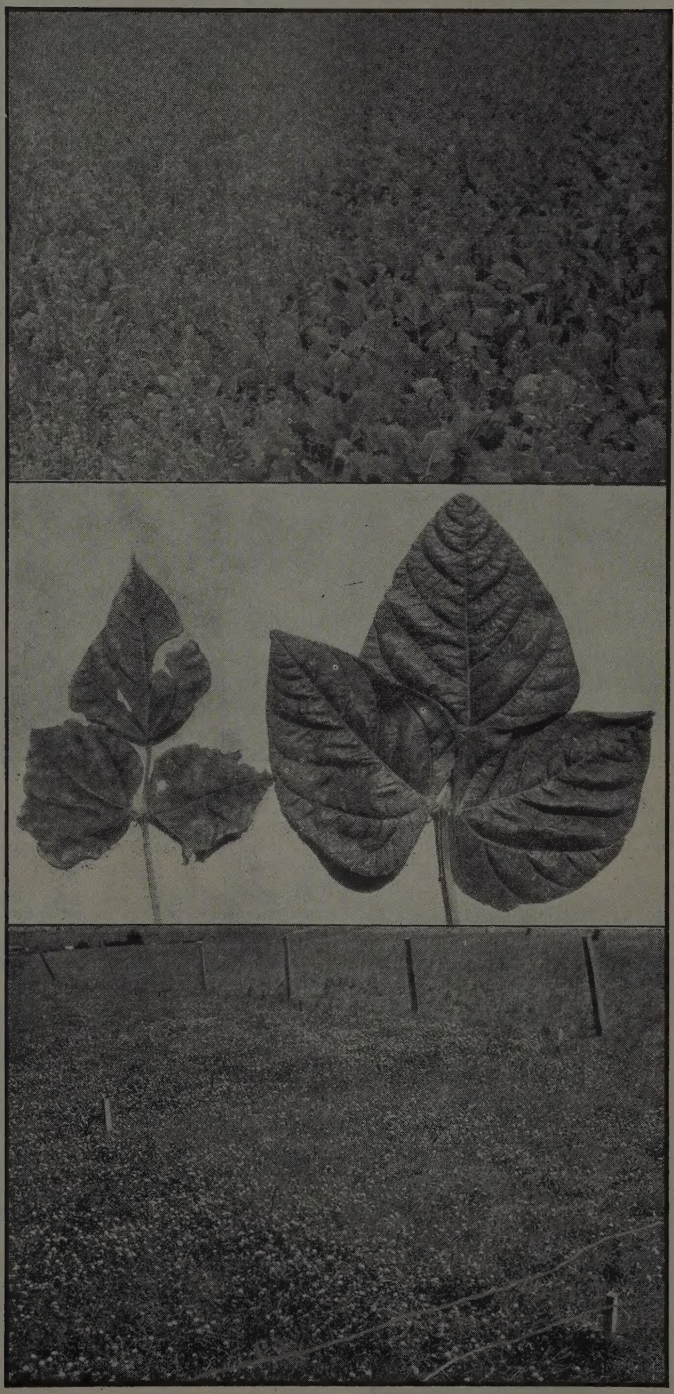
French beans in an Oamaru garden gave a remarkable response to sulphur. The plants in the foreground received a dressing of sulphur and the half row in the background had no sulphur. Those without sulphur were so poor that eventually they had to be replaced with a new sowing. The bean leaves showed marked deficiency symptoms.

BELOW: A sulphur trial on the property of Mr. J. Mavor, Airedale. Half the area on the left with the vigorous clover growth received sulphur at the rate of 28lb. per acre (foreground) and the other half superphosphate at the rate of 2cwt. per acre. The area on the right has had no treatment. There has been no response to 1cwt. of double superphosphate per acre in this trial.

The tarry soils extend over a wide area of North Otago from Tokarahi to Kakanui on the coast. Wherever these are found it is likely that sulphur may give responses. Trials showing responses have been located in the following areas: Airedale, Weston, Alma, Totara, Teschemakers, and Kakanui.

Previously all responses to superphosphate were attributed to the phosphorus influence only. This recent work shows, however, that responses to superphosphate have sometimes been due to phosphorus, sometimes to both phosphorus and sulphur, and sometimes to sulphur only. All three of these conditions apparently occur in North Otago.

The first series of trials were designed to test sulphur and sulphates with fertilisers without sulphur and to compare superphosphate (containing sulphur) with double superphosphate and oxalic superphosphate



Left—This remarkable result in a rape crop on the property of Mr. W. S. Perry, Totara, was obtained with a dressing of 28lb. of sulphur per acre. The left-hand part received no treatment. This paddock was considered very highly fertile and had produced abundant crops of clover seed before being ploughed for rape.

Left—The vigorous, healthy development of the bean leaf on the right contrasts markedly with the growth of the other leaf, on which the pale areas between the veins stand out plainly.

Left—Some of the plots on the sulphur trial on the property of Mr. W. G. Spite, Alma. The plot in the left foreground received sodium thiosulphate at the rate of 100lb. per acre and that in the right foreground, which showed no response, molybdenum at 2½oz. per acre. On the plot behind the sodium thiosulphate plot sulphur was applied at the rate of 28lb. per acre, and behind the molybdenum plot another plot received sulphur at the rate of 112lb. per acre. The photograph was taken 18 months after treatment. There is a good response in this trial to 2cwt. of superphosphate per acre, but not to 2cwt. of oxalic phosphate or 1cwt. of double superphosphate forms which contain no sulphur. Responses were also obtained from plots on which per acre dressings of 28lb. and 56lb. of the sulphates of copper, magnesium, manganese, and iron were applied.

(forms containing phosphorus but no sulphur). The next series was simplified to a comparison of superphosphate, double superphosphate, sulphur, and a sulphate.

In the first series all the sulphur plots, both elemental and sulphates (such as sulphates of iron, magnesium, manganese, or copper), gave responses, whereas the plots with fertilisers having no sulphur (which included beside oxalic and double superphosphate, borax and sodium molybdate) gave no responses.

In the second series responses on the heavy "tar" soil were obtained from sulphur and superphosphate, with a slight response to the sulphate used, but no response to the double superphosphate. In this series the comparisons were superphosphate at 2cwt. per acre, double superphosphate at 1cwt., sulphur at 28lb., and sodium thiosulphate at 28lb. These responses are shown in the accompanying illustrations.

On the very heavy tar soil there appeared to be no response to phosphate and this is not surprising in view of the very high available phosphate tests recorded for this soil. On a soil of a lighter nature two trials, one at Kakanui and the other at Totara, indicate responses to both sulphate and phosphate. Here responses to both superphosphate and double superphosphate were observed and sulphur also gave a good response. The response to double superphosphate in one of these trials, though observable, was not as marked as that to sulphur or superphosphate. Stock preferred the superphosphate plot, which supplied both sulphur and phosphorus, on this trial.

Another trial in this series at Kakanui has given a very marked response to double superphosphate at 1cwt. per acre.

Symptoms and Types of Responses

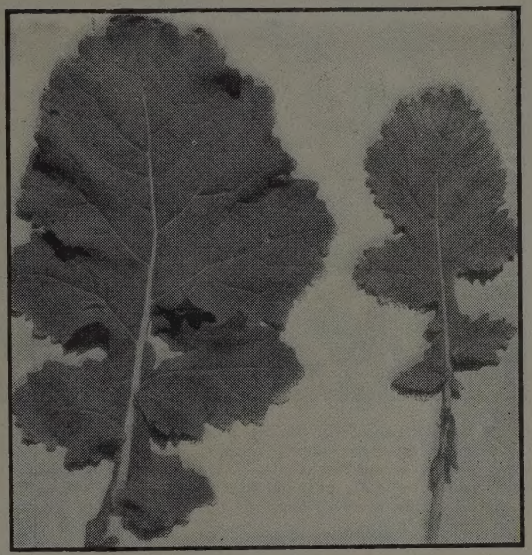
Responses so far have been confined to red and white clovers, to french beans, and to rape. No attempt has been made to investigate the full range of crops that might be involved. One of the first leads to this investigation was the unnatural colour developed in certain rape crops in the district. These symptoms have often been ascribed to natural "ripening" in the rape crop. Interveinal yellowing, the development of bronze colorations often deepening to purplish and red leaf colour, should be suspected. When rape ripens normally it turns bluish or grey-green. The main symptom in clovers appears to be a general yellowing and stunting of the plant similar to the condition in molybdenum deficiency.

Symptoms in turnips and chou moellier similar to those in rape have also been noted (as in the plants on which the tests referred to on page 435 were made). These no doubt would respond to sulphur treatments. The symptoms in french beans are similar to those in rape. The leaf is not malformed as in molybdenum deficiency, the yellow coloration is distinct between the veins, and the veins seem to stand out dark green by contrast. The leaf veins in molybdenum deficient plants seem also to be yellowish. Though not malformed, the leaf is very stunted. The illustration on page 436 of bean leaves and that at right of rape leaves show this.

An interesting occurrence in the rape crop illustrated on page 436 was observed on the sulphur treated area. Some of the leaves on the sulphur treated area were perfectly normal on one side of the midrib and pronouncedly abnormal on the other side. The abnormality was exactly the same as that occurring in the untreated rape plants.

Rates of Application of Sulphur

At the outset of these investigations no reliable information on the question of rates of application of sulphur was available to the author. Normal rates of superphosphate and approximately half rates of non-sulphur forms of phosphate were used (that is, in North Otago 1cwt. to 2cwt. per acre of superphosphate and oxalic superphosphate and ½cwt. to 1cwt. of double superphosphate). The sulphates were used at 28lb. and 56lb., the sodium thiosulphate at 100lb., and sulphur at 28lb. and 1cwt. per acre.



These rape leaves indicate clearly the difference between plants receiving sulphur and those not receiving it. A healthy, vigorous, well-grown leaf is on the left and a stunted mottled green and yellow leaf on the right. Unlike plants deficient in molybdenum the right-hand leaf is of fairly normal formation. The yellowing is between the veins, which stand out quite green.

Pasture responses to sulphur on the property of Mr. W. S. Perry, Totara. The sulphur plot on the left shows a dense mat of clover growth compared with that in the foreground, which received borax and which gave no response. Sulphur and sulphates and superphosphate all gave a big response on this trial, whereas double superphosphate and oxalic phosphate forms without sulphur showed no response. This trial revealed the first possibilities of sulphur deficiencies on the tarry soils of North Otago.

In the second series the comparisons were simplified to 2cwt. of superphosphate, 1cwt. of double superphosphate, 28lb. of sulphur, and 28lb. of sodium thiosulphate. Two hundredweight of superphosphate contains about 20lb. of sulphur.

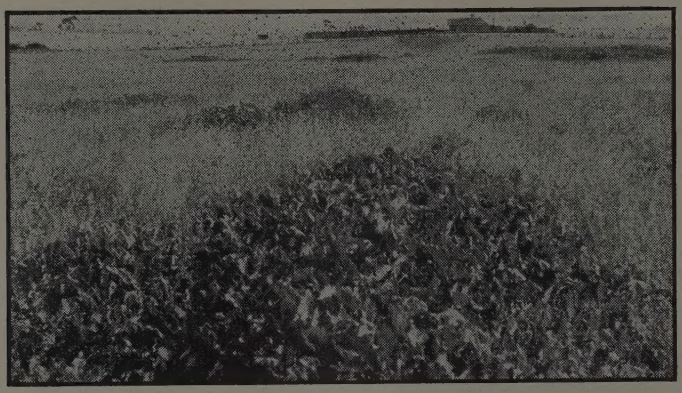
From the results obtained in this series some approximation of the rate of sulphur necessary can be determined, though no direct trials to evaluate the exact position have yet been made. The optimum amount necessary is likely to lie somewhere between the amount supplied in 2cwt. of superphosphate (20lb.) and the amount used in the 28lb. sulphur dressing. The amount is also likely to vary with certain soils and certain conditions on the same soil type, though as low as 10lb. to 20lb. of sulphur may give good responses.

The trials begun in 1952 have shown that the 28lb. dressing of elemental sulphur is having a marked residual effect, as are the other treatments, though to a less degree.

Future Work

These responses to sulphur are being obtained on soils considered to be among the most highly fertile in the district. The deterioration in pastures on these soils in the past may have been due to a lack of sulphur or a gradual imbalance of sulphur with some other element or elements during the period in pasture. This imbalance can continue into at least the first crop following pasture.

The ultimate effect of the use of sulphur on these areas is difficult to



Patches of vigorous and healthy growth have occurred in abnormal and stunted crops on areas where sulphur responses are being obtained and they show up extensively in certain crops after cultivation of the fields. These healthy patches were common in the rape crop illustrated on page 436 and the same characteristic appeared in the same paddock in the chou moellier crop shown above. The use of sulphur in the rape crop corrected the deficiency on the poor patches and brought about growth somewhat similar to that on the healthy patches.

assess, but to those who have seen, and to those who have experienced the increases in pasture and crop production, it must obviously mean much.

Superphosphate consists of approximately equal proportions of monocalcium phosphate and calcium sulphate. Where it has definitely been shown that sulphur in the superphosphate has been solely responsible for increased plant growth some cheaper form of sulphur other than manufactured superphosphate should be sought, and investigation of the most economic form should be made. Where both sulphur and phosphate are deficient superphosphate is the best form of fertiliser to use.

Under moderate rainfall sulphur is usually readily lost by leaching and therefore on areas where heavy superphosphate dressings have been applied for many years, the effect from these dressings is now possibly coming from the sulphur and not from the phosphorus supplied.

Much work is needed to study this matter and to define the extent of sulphur deficient areas. Investigative work in North Otago in the coming year will be concerned mainly with the testing of different sulphur-containing materials and the extension of these trials to other soil types in the district.

Meteorological Records for September

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in Inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	53.2	— 0.6	68.8	31.2	7.70	14	+ 2.56	2.70	12	142.0
Auckland	160	54.4	— 0.1	67.2	40.2	4.11	7	+ 0.32	1.82	12	131.0
Tauranga	10	52.0	— 0.6	66.8	30.3	2.86	7	— 1.36	1.25	13	202.3
Ruakura	131	50.9	+ 0.0	67.8	30.1	1.26	8	— 2.42	0.80	6	153.6
Rotorua	975	49.8	+ 0.1	66.2	30.1	2.48	8	— 2.09	1.10	6	189.3
Gisborne	12	51.2	— 0.9	69.3	33.7	3.95	14	+ 1.33	2.09	13	175.3
New Plymouth ..	160	52.2	+ 0.5	64.0	36.5	2.14	8	— 2.76	0.98	6	187.1
Karioi	2125	45.0	+ 0.0	68.2	24.0	1.07	8	— 3.20	0.44	7	183.6
Napier	5	52.0	+ 0.0	69.4	33.9	1.19	12	— 0.78	0.70	13	132.0
Wanganui	72	52.0	— 0.1	65.8	36.2	0.81	8	— 1.73	0.37	7	176.4
Palmerston North .	110	51.6	+ 1.1	64.7	37.0	1.48	8	— 1.53	0.62	6	132.0
Waingawa	340	49.4	+ 0.1	70.0	29.0	1.92	10	— 1.35	0.43	6	180.7
Wellington	415	50.5	+ 0.6	61.7	37.3	3.38	11	— 0.46	1.68	6	202.3
Nelson airfield ..	5	48.3	+ 0.1	70.6	29.2	2.07	2	— 1.09	1.74	6	240.0
Blenheim	12	48.9	— 1.3	69.0	28.5	1.37	2	— 0.91	1.05	6	222.6
Hokitika	15	47.4	— 0.4	61.0	29.0	3.61	14	— 5.01	1.04	7	222.8
Hanmer	1270	45.2	— 0.9	71.0	26.0	1.51	5	— 2.92	0.57	6, 7	222.9
Christchurch ..	22	48.5	— 0.2	76.4	28.3	1.21	5	— 0.85	0.67	6	205.4
Ashburton	323	48.6	+ 0.7	78.8	27.6	0.85	5	— 1.77	0.30	6	197.8
Timaru	56	47.6	— 0.3	75.8	28.9	0.14	2	— 1.81	0.11	27	178.4
Alexandra	520	47.7	+ 0.6	71.2	25.8	0.35	4	— 0.47	0.18	26	207.2
Taieri	80	46.0	— 1.7	72.5	24.8	0.53	8	— 1.40	0.14	25	179.5
Invercargill airfield	0	45.6	— 0.1	67.1	27.7	1.93	10	— 1.29	0.71	25	172.3

Book Review

"Te Waimate": E. C. Studholme

ONE hundred years ago in July, Michael Studholme made his compact with the Maori chief Huru Huru near the present site of Waimate and took up the run of the same name. The people of Waimate have been celebrating their centennial recently and the occasion is appropriate for the reissue of Edgar Studholme's book "Te Waimate".

This book is not only an account of the development of Waimate Station and the career of the Studholme brothers from 1854, but is a rich store of information on the earlier stages of pastoral farming in New Zealand. Few men were better fitted to undertake this task than Edgar Studholme. Born in 1866, he spent his whole life until his death in 1949 at Waimate. The history of this run epitomises, as Acland pointed out in his "Early Canterbury Runs", the story of squatting in Canterbury, and the successes and failures of the Studholme brothers typify the career of many of the pioneer runholders.

Rapid Progress

Compared with the progress of many places in the North Island, that at Waimate was fairly rapid and the Studholmes were encouraged to take up several other runs in both islands. But though conditions may have been a little easier than elsewhere, the development of a station the size of Waimate was an immense task. Not only was it stocked and fenced and much of the easier country ploughed up and sown in English grasses, but the lower-lying parts were drained at heavy cost and today form some of the most fertile land in the country.

At Waimate in the 1880s not only were 40,000 to 50,000 sheep carried, but about 5000 acres were sown in crops—wheat, oats, and turnips. At that time the cropping was even more important than the stock and on some of the best land very high yields were obtained. Edgar Studholme was a keen observer of the local scene. He wrote with affection of some of the men who worked at Waimate, picturesque characters of a type that has long since disappeared. He was also an observer of nature, and his chapters on the changing face of the landscape are among the most interesting in the book. Frequent burning, prolonged hard grazing, and the replacement of native by introduced grasses have not only changed the vegetative cover, but have had a profound effect on bird and animal life. Many people may have observed these changes over the years, but Edgar Studholme was one of the few who left a record of them.

—*P.R.S.*

A. H. and A. W. Reed. 30s.

Milk-producing Value of Summer Feeds

TOO much reliance on favourable weather for production in every season was suggested as the weak link in seasonal dairying by J. C. Percival, Research Officer, Department of Agriculture Animal Research Station, Ruakura, in an address at this year's Ruakura Farmers' Conference. More proficiency in the smoothing out of peaks and troughs of pasture production to meet the less fluctuating requirements of dairy cows was essential to the attainment of a consistently high level of production every season, he said, and in the following adaptation of his address the relative food value in terms of animal products of some of the commonly used summer supplements is discussed in the light of research findings at Ruakura.

UNDOUBTEDLY this country's supremacy as an exporter of dairy products at cheap costs is due to its favourable grassland climate. So much reliance is placed on favourable weather for production that to many it has become the weak link in seasonal dairying. Is not too much reliance, in fact, being placed on favourable weather in every season? As long as farmers are prepared to rely on the vagaries of the climate for pasture growth then they must be prepared to accept the occasional unrewarding drought year with its financial repercussions.

To attain a consistently high level of production every season more proficiency at smoothing out the peaks and troughs of pasture production to meet the less fluctuating requirements of dairy cows is essential.

How much is production being affected by poor stock feeding, the direct result of poor pasture management?

Ten years ago C. P. McMeekan instituted an experiment at Ruakura to find out the lifetime effects of a system of feeding cows well at all seasons of the year compared with a system whereby the animals are subjected to periods of plenty and periods of paucity, depending on the seasonal grass growth.

Data for seven seasons beginning with the 1946 season and ending with the 1952 season, seven relatively good seasons because the poor seasons of 1945 and 1953 are excluded, show an average seasonal gain of 43lb. of butterfat per cow for controlled grazing. About a third or 13lb. of this gain was achieved in early spring, leaving a gain of 30lb. made from mid-December until the end of the season. This means that far better farm and cow management is necessary to get a cow to maintain good production after mid-December than is required earlier in the season.

Controlled grazing management aimed at securing a high uniform feed supply will increase production by some 10 per cent. from Christmas until the end of the dairying season. Increased per cow and per acre returns will be greater than 10 per cent. in poor years characterised by marked seasonal fluctuations in grass growth, with a less than 10 per cent. gain in production in seasons of good growth.

In a herd adequately fed during summer and autumn 60 per cent. of the total fat production will be obtained before the end of December and 40 per cent. after. In a herd inadequately fed during summer and autumn more than 60 per cent. of the total seasonal production will have been obtained before the end of December.

What is known about the relative food value in terms of animal products of some of the commonly used summer supplements?

To date it is possible to report on the results of comparing green lucerne with silage over two seasons, silage with turnips in one season, and good silage against poor silage over the last dry period of 1953-54. The results of these experiments are reviewed in the following section of this article.

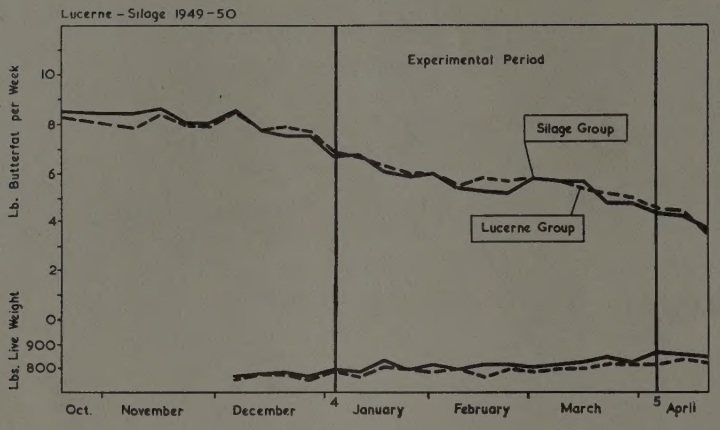


Fig. 1.

Lucerne and Silage Feeding Trial 1950

Fig. 1 shows the comparison between the mean lactation curve in pounds of butterfat per cow per week of a group of cows fed lucerne and that of a group of cows fed silage in the summer of 1950. A comparison between the liveweights of the two groups is also presented. In this and subsequent graphs the experimental feeding period is enclosed by the vertical lines.

Nine sets of identical twin cows were used for the experiment. The similar levels of fat production for the split twin groups indicate the uniformity of production before the start of the feeding trial during October, November, and December, 1949, when both groups were grazing on pasture. Supplementary feeding started on 4 January and continued for 13 weeks, terminating on 5 April, when both groups reverted to pasture alone.

The lucerne stand was cut daily, the material being carted off and fed on the grazing area. The stack silage was fed similarly. Both groups were offered as much supplement as they were able to eat without undue wastage occurring. Each group of cows grazed separate areas which initially appeared to have about the same amount of grass cover. The stocking rate was one cow per acre and the cows were shifted daily through a rotation of 14 paddocks.

Production had begun to fall during December and continued to decline during the first 5 weeks of supplementary feeding. Rain in mid-February revived pasture and the fall off in production was arrested over the next 5 weeks until mid-March, when production again began to fall off and continued to do so after the termination of supplementary feeding. From a pre-experimental level of 7lb. of fat per cow per day production declined to 4lb. of fat per cow per day.

The interesting point is that at practically no stage of the feeding experiment did the lucerne supplemented cows show any marked superiority in butterfat production over their silage supplemented twin mates. The slight superiority of the lucerne during February coincided with the finish of the first cut of lucerne, which was then in full flower and more fibrous, and at the start of the second cutting the lucerne was at a much younger stage of growth.

Liveweight changes over an experimental feeding period provide useful additional information about feedstuffs.

The feed consumed by milking cows is partitioned among three major physiological processes. First of all by far the biggest proportion of the feed eaten is used to maintain the animal body and the remainder is under competition between the lactation mechanism and the growth process. Whether milk production will have priority over the growth and fattening process depends on the dairying merit of individual animals, the stage of lactation, and the quality of the feed.

The normal weight graph for a good milking cow adequately fed throughout the season shows a progressive loss for 6 to 8 weeks after calving and then a progressive but marked gain in weight during the peak lactation period; from January until next calving there is a steady gain. Most of the increase in weight from January represents foetal growth, so that true body-weight remains fairly steady during this period.

Marked gains in body-weight during summer may be the result of poor-quality dairy stock incapable of reasonable levels of milk production, so that food normally used for this process is used for the fattening process. In good-quality dairy stock marked gains in weight during summer would indicate that feeding is adequate in quantity but lacking in quality for milk production.

In the lucerne-silage comparison for the 1950 summer both groups not only maintained condition, but showed better than average gains, with only little difference in gains between the two different supplements.

Cows receiving lucerne ate 80lb. per cow per day, compared with 50lb. of silage, and if these figures are converted on a dry matter basis, the respective intakes were 17lb. from lucerne and 11lb. from silage. Despite the 50 per cent. higher consumption of lucerne, which is a good indication of its palatability, no advantage in terms of fat production or liveweight gain was achieved. As the amount of feed each group obtained from pasture is not known, it can be concluded only that the lucerne supplemented cows preferred to eat lucerne rather than summer pasture and that the total amounts of grass plus supplement eaten were the same for both groups. As grass cover was maintained throughout the trial, it was possible for the silage group to obtain a bigger proportion of their total feed from grass. If this occurred, it was not obvious on eye appraisal of the two separate grazing areas.

Lucerne and Silage Feeding Trial 1951

In the following summer of 1951 the lucerne-silage comparison was repeated along very similar lines to that of the previous season with the use of two groups each of seven cows. The only major change in technique was that a considerably higher stocking rate was used—about three cows per acre during the supplementary

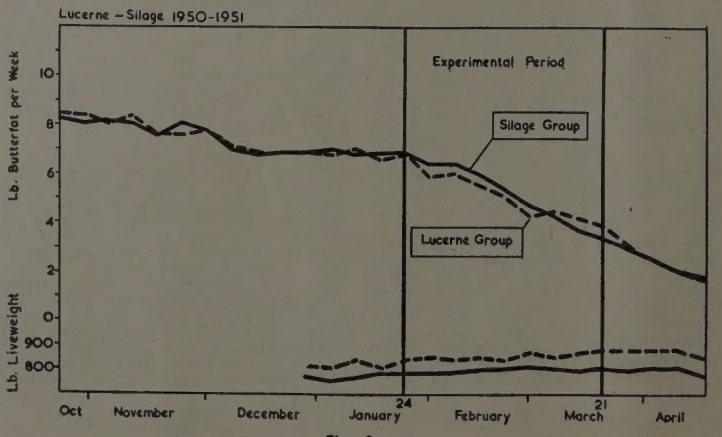


Fig. 2.

feeding period. This was to ensure a high intake of supplement and to reduce the possibility of one group balancing up its intake by eating less supplement and more grass as was believed to have occurred in the previous season's experiment.

Fig. 2 shows the lactation curve in pounds of butterfat per cow per week and the liveweight changes for each group. Before the start of supplementary feeding both groups were producing at similar levels. Supplementary feeding started on 24 January and continued for 8 weeks. Both supplemented groups showed a fairly rapid decline in production from about 7lb. to 3½lb. of fat per cow per week. In the first 5 weeks the silage fed cows were ahead in production by less than ½lb. of fat per cow per week. For the following 3 weeks the lucerne fed cows were ahead in production by a similar amount. The net effect was a gain of 1lb. of butterfat per cow over the 8 weeks in favour of silage. The small advantage that the lucerne cows had in production at the end of the feeding period was largely lost a week after the end of the experiment.

There was an initial difference in liveweight of about 50lb. between groups. The silage fed cows showed a slight but normal gain of 13lb. and the lucerne fed cows showed a marked gain of 50lb. per cow.

The amount of silage eaten was similar to that of the previous summer at a level of 11lb. of dry matter per day; lucerne consumption at 15lb. was slightly less than the previous season's figure of 17lb. With the higher stocking rate used in the 1951 summer there was no differential intake of grass by the two groups. Measurement of individual intakes confirmed that both groups obtained similar amounts of pasture, so that the higher intake of lucerne was diverted toward body-weight gains and not milk production.

Turnip and Silage Feeding Trial 1951

In the 1951 summer a feeding trial was also undertaken to compare turnips with silage as a milk-producing feed. Nine sets of identical twins were split into two groups and the experiment was conducted along similar lines to the previous ones; that is, separate but similar grazing areas and the adoption of a rotational grazing system involving a move each day into a new paddock. Silage and turnips were fed to provide an intake level of about 10lb. of dry matter per cow per day over the 8-week experimental period. In general it was noted that, in comparison with silage, the turnips had a laxative effect, but this did not seem to affect the health of the cows adversely, except one which scoured very badly and had a relatively low production. Her production record, however, was not excluded from the results, as it was likely that the turnip diet was directly responsible for her digestive upset.

Fig. 3 indicates the production trends and liveweight changes for each group. The turnip fed cows produced more butterfat than their silage fed twins in 7 of the 8 weeks of the experimental period. The increase in production from the turnips was about ½lb. of fat per cow per week for the first 4 of the 8 experimental weeks and then tended to increase to almost 1lb. in the last week, giving an average difference of ½lb. of fat per cow per week.

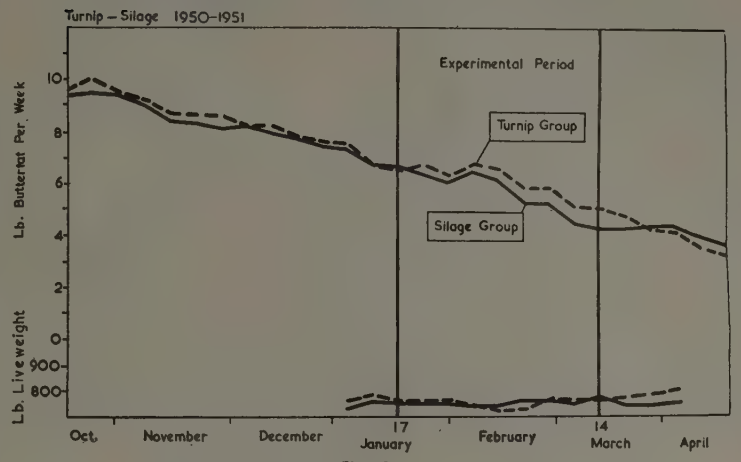


Fig. 3.

This advantage was equivalent to practically a 10 per cent. increase in butterfat yield.

The pasture growth during the first 4 weeks of the trial was relatively good, but slowed down appreciably toward the end of the trial owing to lack of rain.

After the experimental period the two groups were treated similarly by being pastured together and allowed as supplementary feeding approximately equal amounts of turnips and silage. The beneficial effect of feeding turnips was very transient. At the end of the first week after the cessation of the trial the productions of the two groups were practically equal. Thereafter the group previously fed on turnips produced less butterfat than the other group.

The different members of twin sets reacted differently, though under similar treatment. For instance, at one end of the scale one set showed an average weekly difference of 1¼lb. of fat in favour of the turnip fed twin, and at the other end a turnip fed twin averaged nearly ¼lb. of fat less than her twin.

This is recognition of the simple fact that cows of different breeding will react differently to the same treatment. It also means that though all the twins had equal opportunities to eat their respective supplements, some of the twins may have relished turnips and their mates may have hated silage. Others may not have eaten their fair share of turnips and their mates may have eaten more than their fair share of silage.

The graphical representation of the liveweights in Fig. 3 shows that the twins of the turnip group were heavier than their twins before the experiment. They lost weight to such an extent that they averaged at the end of the fourth week nearly 30lb. lighter than the silage fed cows. After this they began to regain condition, but were still slightly lighter at the end of the experiment. However, immediately after the conclusion of the experiment the weight relationship between the groups returned to the original position. This rapid change suggests that the true body-weights of both groups of twins remained practically unaffected and that the apparent loss of body-weight caused by turnip feeding was due to its scouring effect.

Good and Poor Silage Feeding Trial 1953-54

In the next aspect of this work the results of a comparison between good silage and poor silage as summer supplements are described.

A commonly held belief is that the earlier cuts of grass produce a silage that is higher in feeding value than later cuts and consequently it is considered good dairy farm management to use these early cuts for summer supplementation and to use the later cuts for winter feeding.

There is a very great depreciation in pasture quality or feed value between the leafy and the flowering stages for most pasture plants, and at the flowering stage grass has lost its high feed value. The further deterioration in feed value between the flowering and the seeding stage is relatively not so marked.

Practically no silage, even the so-called early cuts, is made before some of the pasture plants, principally Yorkshire fog, are well into the flowering stage. Consequently it is argued that the resultant silages from early and late cuts of grass probably differ very little in feed value. It seems somewhat odd that though cows are not expected to milk to capacity on a paddock of grass that is at the stage of growth for cutting for silage, good feeding value is expected when the same grass is fed back as silage.

In an attempt to make a high-class silage grass was cut in the leafy stage, when it was equivalent to good cow grazing fodder. Because of the early cutting, yield measurements approximated 1¼ tons of dry matter per acre or only slightly more than half the yield from a normal crop yielding 2 tons of dry matter. The material was wilted in the paddock for about 24 hours and ensiled in a pit with a

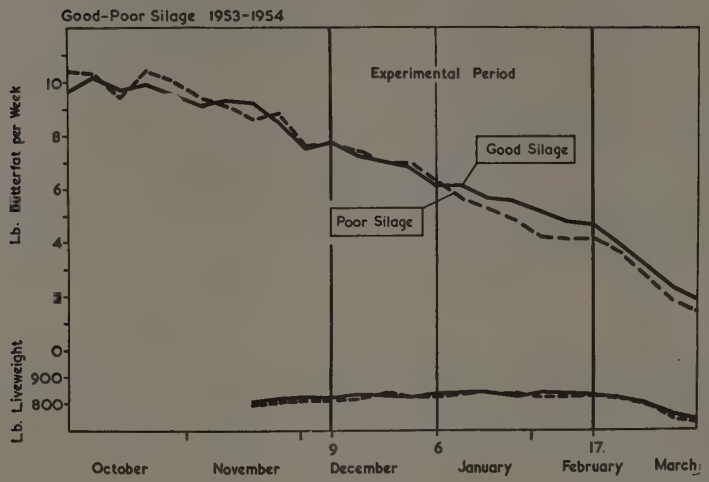


Fig. 4.

buckrake. The poor silage was made from very rank grass carried over from autumn-saved pasture, and this material was ensiled in a stack without wilting.

Preliminary chemical analysis of the two silages showed the poor material to contain 12 per cent. of protein and 33 per cent. of fibre, which approximates the analysis for the usual run of silages, but the good material had 20 per cent. of protein and 20 per cent. of fibre, an analysis which is regarded as representing a high-quality silage.

The summer feeding experiment was carried out with 12 sets of twins and the procedure was very similar to that described for the previous experiments.

Fig. 4 indicates the production trends and liveweight changes for each group. The experimental period is divided into two sections.

In the first section, which covered an interval of 4 weeks beginning on 9 December, both silages were fed to provide an average consumption of 4lb. of dry matter per cow per day. The dry weather had started, but there was reasonable grazing available on the separate areas during this period.

Both groups were producing almost equal amounts of butterfat per cow per week before supplementation and the relative positions were preserved during the next 4 weeks, with production declining.

By 6 January pasture feeding conditions had deteriorated and silage feeding of both groups was raised to an average level of 10lb. of dry matter, which was equivalent to some 50lb. of wet material. This feeding level was maintained for the following 6 weeks.

When the consumption of silage was increased from 4lb. to 10lb. of dry matter per day there was an immediate effect on fat production in favour of the cows fed the good-quality silage. Twins fed good silage out-produced their mates by practically a constant amount of ½lb. of fat per cow in each of the 6 weeks of feeding. This represents a 10 per cent. increase in fat production over the 6 weeks. The general decline in production which had set in earlier continued for a further 4 weeks, but the decline appeared to have been arrested in the last 2 weeks of the experimental period.

Supplementary feeding was discontinued on 17 February and the cows remained on their respective areas, which until then had retained some grass cover. With cessation of silage feeding production declined very rapidly, the cows previously on the good silage retaining only some of their previous advantage.

The liveweight trends indicate that condition was just being maintained by both groups during both levels of silage feeding, but on cessation of feeding there was a rapid loss in weight. Four weeks after the experiment each group had lost some 90lb. in condition.

Analysis of Experiments

The experiments described have been undertaken solely to determine the effect of these feeds on cow production over the low rainfall period of the year normally occurring between mid-January and mid-March. The increases obtained have been far from spectacular.

In each of the four feeds used, green lucerne, turnips, good silage, and just plain silage, there are very gross differences in protein content, fibre content, and over-all digestibility. In other words, to the chemist each of these foods has a very different make-up; from the cow they elicit not very different responses. Does this suggest that the feeds other than silage offer little advantage in quality and that the despised silage might be as good a summer supplement as any? The author of the address from which this article has been adapted believes that essentially this is so.

In these experiments consideration has not been given to all the factors governing the role which each of these feeds can fulfil in New Zealand's essentially grassland dairying system. If the feed quality of these supplements is not very important, their relative usefulness will be governed more by their relative yields of food per acre. Quantity not quality then will be the overriding consideration in determining their respective superiorities.

High per cow and per acre production can be and is being obtained and sustained from one dairying season to the next on grass and grassland products. These herds are being well fed and can afford to be well fed on silage during an average summer, because all of the spring surplus is being saved. Up to 50 per cent. of the farm area is cut as hay and silage. Under these conditions there seems little justification for growing special summer crops each year to safeguard against the odd drought year. Some reserves of silage will be carried over from one year to the next and will normally suffice. The aim should be to get heavy silage crops consistent with pasture recovery.

In contrast, most dairy farmers conserve only about 20 per cent. of the farm area as hay and silage and carry over into summer variable amounts of rough feed. Production within the season and between seasons on these farms depends more on grass growing conditions, and farm returns consequently will be depressed in poor seasons and only equal to, but never better than, the returns from well-controlled pasture farms during very good dairying seasons.

Such farms need to conserve larger areas of silage. Better pasture control through break grazing and modern methods of silage making are being used to achieve a larger pasture conservation programme.

Where the general level of pasture productivity is poorer cropping will have a marked twofold benefit. First, larger amounts of feed are provided during a period of critical pasture growth and secondly as a result of the sowing down to improved strains of grasses and clovers there will be better pasture growth.

The growing of summer crops such as turnips and kale will provide much more feed per acre when required than the adoption of any other practices. Both turnips and lucerne need to be used at the right stage of growth; otherwise there is a rapid deterioration in quality. In this respect kale has a distinct advantage, as it can be used when required. Lucerne appears to be suited to particular soil types and generally is not an easy crop to grow and maintain in a vigorous condition. It should be grown where conditions favour its yield and where other considerations limit the use of silage making and cropping.

Finally, any measure which ensures a better level of summer supplementary feeding will have a considerable pasture sparing action. The pasture is not bared to the ground and consequently soil moisture losses are retarded and growth is sustained longer. Recovery of overgrazed pastures is slower and this materially affects the pasture reserves on the farm at the beginning of winter. Summer overgrazing upsets the grass: clover balance, resulting in clover dominance after autumn rains and thereby increasing the risk of bloat.

A high level of summer supplementary feeding is probably as beneficial in indirect after-effects as in the effects during the feeding period.

Use of Buttermilk and Skimmed Milk Powders for Pig Feeding

MARKETS for both buttermilk and skimmed milk powders have weakened seriously over the past year and this has brought these high-quality feeds within the scope of the pig producer. Many farmers have now had successful experience of the use of these foods, and in this article A. Longwill, Superintendent, Pig Industry, Department of Agriculture, Wellington, deals with their use in pig feeding and considerations which will govern the choice of concentrate feeds for this purpose.

THOUGH it is considered that it would never be economic to process skimmed milk or buttermilk into powder to make a storable pig food, as against using the liquid when available on the farm, there are occasions when the pig producer will be encouraged to consider the use of powder as a pig food. These occasions will be:—

1. When the market for these powders is weak and prices are comparable with those for other stock foods.

2. When a grade of the powders unfit for human consumption is available at a reasonable price.

3. When a special starter food for the creep or early weaning is required.

4. For other special purposes, such as when a sow dies and leaves a young litter which requires "artificial" milk.

Apart from the two last-named purposes, which necessitate the use of milk proteins rather than others, such as those supplied in meat meal, the question of whether milk powders should be used in pig feeding is primarily an economic one. Table 1 shows the digestible nutrients of milk powders and other feeds available to the pig producer and, under the heading of total digestible nutrients, a figure on which the feeding values for pigs are best compared. T.d.n. = per cent. of digestible crude protein + per cent. of digestible carbohydrates + per cent. of digestible fibre + (per cent. of digestible oil × 2.3).

In the table at left the nutritive ratio (column 7) is the ratio of protein equivalent (a figure intermediate between digestible crude protein and digestible pure protein which makes allowance for the different nature of the proteins in the former) to carbohydrate equivalent (which includes the figures in columns (4) and (5) in the above table as well as that in column (3)). Those foods rich in protein (with a nutritive ratio narrower than 1 : 4) are specially valuable in the rations of young pigs and nursing sows and can be used in mixtures with low-protein foods, such as sugar beet, whey, or cereals, to provide a well-balanced food for pigs, which should have a nutritive ratio varying from 1 : 4 (young pigs and sows) to 1 : 8 for fattening pigs.

The feeding value obtained in practice from any food will be governed

TABLE 1—DIGESTIBLE NUTRIENTS IN 100LB. OF VARIOUS FEEDS AND THEIR COMPARATIVE VALUES IN PIG FEEDING

Feedstuff (1)	Per cent. digestible crude protein (2)	Per cent. digestible carbohydrate (3)	Per cent. digestible fibre (4)	Per cent. digestible oil x 2.3 (5)	Total digestible nutrients (6)	Nutritive ratio 1 : (7)
Skimmed milk	3.3	5.0	Nil	0.23	8.5	1.6
Buttermilk	3.4	4.1	Nil	1.84	9.3	1.7
Whey	0.6	5.0	Nil	0.5	6.1	9
*Skimmed milk powder	32.0	50.0	Nil	4.0	86	1.6
*Buttermilk powder	35.0	42.0	Nil	17.0	94	1.7
*Dried whey	12.7	73.9	Nil	3.4	90	6
60 per cent. protein meat meal	56.4	0.5	Nil	22.5	79	0.4
50 per cent. protein meat and bone meal	37.2	Nil	Nil	35.0	72	0.9
Maize (dry fed, soaked, or cooked)	7.7	63.8	0.7	6.2	78	9
Coconut meal	15.3	35.4	8.6	15.0	74	4
Barley meal	8.6	59.1	0.5	2.8	71	8
Pollard	12.2	45.0	1.5	7.3	66	4
Oats (farm ground)	9.6	43.2	—	9.4	62	7
Coarse bran	10.3	33.3	1.2	3.4	48	4
Lucerne meal	11.7	24.5	7.4	3.2	47	3
Sugar beet (grated)	0.6	21.6	1.0	—	23	38
Potato peelings (hand peeled)	1.6	16.4	0.5	—	18	10

* On 5 per cent. moisture basis.

HEADING PHOTOGRAPH: Hot liquid pig food containing buttermilk powder being fed out in winter at the New Zealand Co-operative Dairy Company's pig farm at Ngaruawahia. Sparrow photo.

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by the balance attained in the diet fed and its suitability for the animal at different stages of development. It has been shown, for instance, that skimmed milk when fed as the main feed with 1lb. of meal supplements per pig per day has a value lower than shown in the table, as it takes 1 gallon (10lb.) to equate in feed value 1lb. of barley meal. The full value of skimmed milk will probably be obtained only if the milk is fed at a much lower level and the nutritive ratio of the whole diet is within the range quoted above.

In working out the price one can afford to pay for milk powders it will be best normally to compare their price with that of meat meal (the most readily available protein concentrate). If meat meal costs £X per ton, buttermilk powder should, for economic use, be available at the same point for $£(X \times \frac{94}{79})$. For the special purposes mentioned under 3 and 4 on page 443 somewhat higher prices than that arrived at by this calculation would be warranted.

Storage of Milk Powders

The approximate composition of buttermilk powder, skimmed milk powder, and good quality meat meal are given in Table 2. The extremely low moisture content of milk powders when packed is not retained for long when the containers are opened.

Skimmed milk powders, which are low in both fat and moisture, store well provided they are kept in dry conditions. Buttermilk powders, with their 10 per cent. of fat, are much more liable to spoilage. The stock feed grades, which tend to come from the more acid cream buttermilks, are especially liable to spoilage, because the lactic acid or sodium or calcium lactate they contain takes up moisture readily.

TABLE 2—COMPOSITION OF AVERAGE BUTTERMILK POWDER COMPARED WITH COMPOSITION OF SKIMMED MILK POWDER AND A GOOD MEAT MEAL

Constituent	Buttermilk powder	Skimmed milk powder	Meat meal
	per cent.	per cent.	per cent.
Moisture	4.0	3.2	10.0
Fat	10.0	0.9	18.0
Protein	35.0	39.0	67.0
Lactose	42.2	47.5	
*Acidity	0.8	1.4	
Ash	8.0	8.0	5.0

* Expressed as per cent. lactic acid.

Absorption of Moisture

The rate of absorption of moisture by buttermilk powder is influenced by several factors besides that of lactic acid content. These are: (a) The relative humidity of the air in the store. (b) Temperature of storage. The store should be kept as cool as possible. (c) The permeability of the packaging material to moisture. This is normally given proper attention at the factory

Upper right—Plant for spray drying of milk. Middle right—Buttermilk powder. Lower right—Roller drying of buttermilk. Today much of the buttermilk powder produced by this process is available for stock feeding. Upper illustration by Sparrow.

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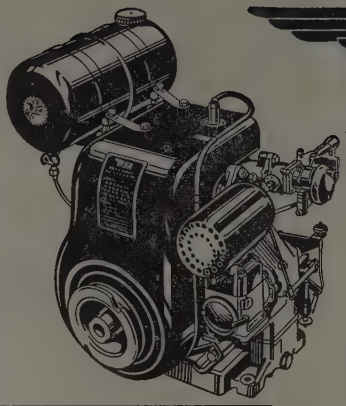

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when the powder is packed, but sewn seams allow more moisture to pass than do properly sealed plastic liners. Damage to containers will allow the powder to take up moisture rapidly. (d) Conditions of storage. Storage in a tight stack in a closed store room helps to reduce water absorption, owing to the protection the packages afford one another and to the dehydrating effect of the powder itself on the atmosphere.

Good conditions for storage of buttermilk powders could not readily be achieved on the farm and therefore this food should be obtained regularly in small quantities rather than in ton, or even ½ ton, lots.

Feeding Milk Powders

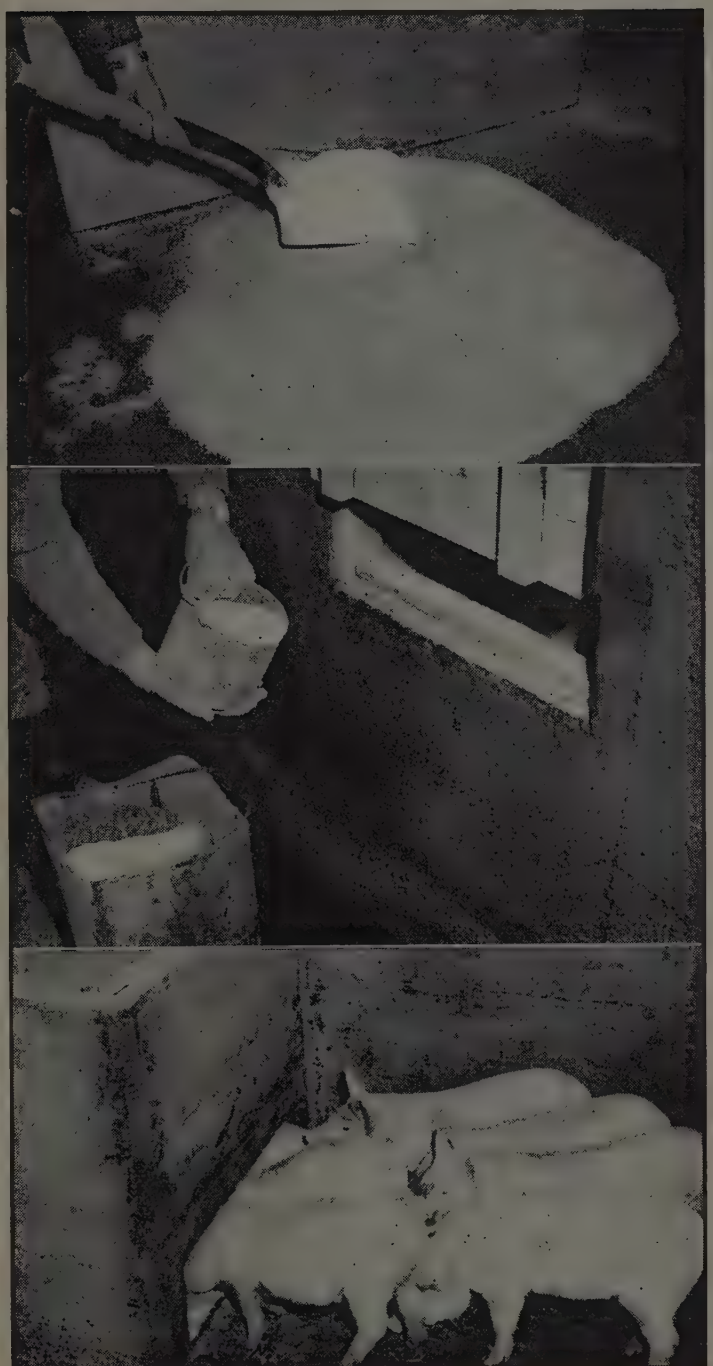
The milk powders may be fed dry or re-constituted with water as a liquid milk. As they are liable to become lumpy unless particular care is taken to add the powder evenly and slowly with constant stirring, it is best if the mixing is done some time before feeding. Hasty mixing is then avoided and a satisfactory re-constitution, without lumps, can be ensured.

However, it is easier and cleaner to mix the powder dry with crushed oats or barley meal in the proportion of 1 part of milk powder to 1 part of crushed oats or barley for creep feeding and milking sows and 1 : 4 or more for other pigs. The trough in which dry meal is fed should be appropriate to the size of the pigs using it, low sided so that they can eat without getting their front feet in the trough, and placed so that they cannot get into it and waste a considerable proportion of the expensive meal. Clean drinking water should always be available in a separate trough.

Before pigs are weaned it will usually prove more economical to change to wet feeding of the concentrate mixture, as dry feeding after weaning is usually very wasteful. It is not economically feasible, as a general practice, to offer dry feed ad lib. in a self-feeder where it could be fed without waste. Hence, the method usually favoured is to mix a fairly thin slop, where clean drinking water is available in a separate trough, or where there is no separate water trough, make a thin gruel by adding 6lb. of the meal mixture to each 4 gallons of water.

The chief virtue of milk proteins is their completeness and suitability as a food for young animals, and this fact fits well with the aim of securing rapid growth and efficient food conversion through the extra food given in the creep to piglets to supplement the sows' milk supply. Whatever can be done to encourage piglets to start taking extra food from the earliest possible age should be done. After the first week or so, during which the sow and litter should if possible have been allowed a run out on good grass, the litter should be shut in with meal in the creep while the sow is allowed out for a few hours during the day. Hunger will then assist the natural inquisitiveness of the piglets to discover the meal and, if it is palatable, they will start to feed from the creep.

In some stock-feed grades of buttermilk powder the degree of acidity may have reached a high level. Feeding a high proportion of such powder may result in scouring, but this tendency



Upper—Mixing buttermilk powder with barley meal for pig feeding. Middle—Feeding dry meal containing 25 per cent. of buttermilk powder in a creep self-feeder. Lower—Suckers feeding at a creep self-feeder on meal containing 25 per cent. of buttermilk powder.

can be counteracted by the addition of 1 per cent. of slaked lime to the feed.

Early Weaning

Special starter feeds based on buttermilk powder and ground oats, sweetened with sugar and reinforced with fats, vitamins, minerals, and antibiotics, are being used very successfully today in getting the litter started feeding independently at a very early age. Pioneer work in this direction has been done in the U.S.A., where it has been proved practicable to wean at 3 or 4 days of age, feed entirely on the dry starter feed ad lb. with water to drink, and achieve weights of about 60lb. per piglet at 8 weeks; these are much better than are normally expected from ordinary rearing on the sow supplemented by creep feeding.

Similar results have been obtained in England and in preliminary trials with this early weaning technique at the Department of Agriculture's Ruakura Animal Research Station. A heat lamp and a 4ft. x 4ft. weaner coop in which the piglets can maintain a temperature of approximately 70 degrees F. are necessary to success in this practice. The greater efficiency of feed use achieved by direct feeding to the piglets as against double conversion through the sow is the obvious advantage of this system. Other advantages may be the arranging of farrowings to have pigs at the right time to use the seasonal dairy by-product feed supply with maximum efficiency, the bringing of individual sows round to more satisfactory farrowing dates, and even reduction in the amount of labour required to rear a litter.

The value of milk powders for the special purpose of early weaning will be considerably higher than has already been indicated. However, the starter foods are mixtures and it is probable that successful results will be obtained only when a complete mixture is used. The practicability of the farmer mixing his own starter food has still to be tested.

Main Uses

Milk powders are the highest quality feedstuff available for pig feeding. There is likely to be a plentiful supply of buttermilk powders on the local market in the immediate future and probably at a price which enables economic use of them in pig feeding. The outstanding value of buttermilk powder as a pig food must be stressed. Provided it is stored under good conditions and a watch is kept to ensure that a high level of acidity is not allowed to cause digestive upsets to the pigs there is no doubt that it will be a very useful and convenient adjunct to the normal pig feeds. The uses to which buttermilk powder is best suited are:—

1. Creep feeding: An early start on independent feeding through creep-fed supplements of high quality ensures increased economy of gain and the basis for improved carcass quality.

2. Supplementing protein-deficient winter crops or whey for all classes of pigs.

3. Supplementing a declining milk food supply to enable pigs which would otherwise be unfinished to reach the premium porker weight (over 60lb.).

4. Early weaning: It will generally be the most satisfactory protein concentrate for this purpose. To justify use of buttermilk in other circumstances its price would have to be comparable with that of meat meal on the basis of their relative values for pig feeding. For practical purposes, if a 60 per cent. protein meat meal costs 33s. a hundredweight, it would pay to use buttermilk powder when its price was about 37s. a hundredweight.

Free Bulletins for the Pig Farmer

Nos.
- 15 Causes of Excessive Waste in the Pig Industry.
- 243 New Zealand Baconer and Porker Carcass Judging Standards.
- 302 Rejection of Pigs by Works.
- 343 Crops for Wintering Pigs.
- 364 The Feeding and Management of the Sow and Litter.
- 366 Production of Quality Pig Carcasses.
- 374 The Ruakura Round Farrowing House.

The above bulletins, part of a series of over 350 on all aspects of farming, are available post free from the nearest office of the Department of Agriculture, or from the Head Office of the Department, Box 2298, Wellington.

Radio Broadcasts to Farmers

RADIO broadcasts to farmers will be given during December as follows:—

1YA Auckland, 7 p.m.

1 December—"Transportation and Finishing Losses in Fat Lambs", by E. Nelson, Livestock Instructor, Department of Agriculture, Auckland.

8 December—"Lessons from the Past Year", by E. H. Arnold, Assistant Fields Superintendent, Department of Agriculture, Auckland.

1YZ Rotorua, 7.15 p.m.

9 December—Topical Farming Notes, by S. R. Hewitt, Instructor in Agriculture, Department of Agriculture, Whakatane.

2XA Wanganui, 8 p.m.

2 December—"For the Countrywoman", by Mary MacDonald.

9 December—"The Radio Vet.", by S. Jamieson, Veterinarian, Wanganui.

16 December—"Lucerne", by A. A. Duncan, Instructor in Agriculture, Department of Agriculture, Wanganui.

2YZ Napier, 7.10 p.m.

7 December—"Harvesting Seed Crops in Hawkes Bay", by F. H. Collin, Fields Instructor, Department of Agriculture, Hastings.

2ZA Palmerston North, 12.33 p.m.

6 December—"Sheep Feed and Feet", by D. L. Calder, Livestock Instructor, Department of Agriculture, Palmerston North.

13 December—"Haymaking", by E. G. Rose, Instructor in Agriculture, Department of Agriculture, Palmerston North.

20 December—"Some Causes of Poor Quality Cream", by H. A. Scott, Farm Dairy Instructor, Department of Agriculture, Feilding.

3YA Christchurch

9 December (7.15 p.m.)—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Fields Instructor, Department of Agriculture, Rangiora.

20 December (12.20 p.m.)—"The Farming Year", by C. C. Leitch, Fields Superintendent, Department of Agriculture, Christchurch.

4YZ Invercargill, 7. p.m.

7 December—"Field Drainage", by K. L. Mayo, Instructor in Agriculture, Department of Agriculture, Invercargill. "Litter in the Fowl House", by I. D. R. McKenzie, Poultry Instructor, Department of Agriculture, Dunedin.

14 December—"Field Drainage", by K. L. Mayo, Instructor in Agriculture, Department of Agriculture, Invercargill. "The Honey Crop", by S. Line, Apiary Instructor, Department of Agriculture, Invercargill.

21 December—"Field Drainage", by K. L. Mayo, Instructor in Agriculture, Department of Agriculture, Invercargill. "D.D.T. and Grassgrub Control", by T. Sewell, Instructor in Agriculture, Department of Agriculture, Gore.

Regular Sessions

1XH Hamilton, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8.5 p.m., Wednesdays at 8.1 p.m. (Northland stock market report), Fridays at 8.1 p.m.

1YA Auckland, Tuesdays at 12.35 p.m., Wednesdays at 7 p.m., Thursdays at 12.33 p.m., Saturdays at 6 p.m. (Auckland stock market report).

1YD Auckland, Thursdays at 7.30 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month), Thursdays at 12.33 p.m. and 7.15 p.m. (fortnightly).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawkes Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawkes Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Thursdays at 12.33 p.m.

4YA Dunedin, Mondays at 12.33 p.m., Wednesdays at 7 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m., Tuesdays at 7 p.m.

Preliminary Report on Orchards Survey: Tree Fruits Section

DURING the winter and spring of 1953 district officers of the Horticulture Division carried out a survey of orchards throughout New Zealand, recording the number of trees according to age and condition of each variety and kind. A preliminary report on the survey is given in this article by J. H. Watt, Horticultural Economist, Department of Agriculture, Wellington.

ALL the following kinds grown commercially were included in the survey:—

Pip: Apple, pear, quince.

Stone: Apricot, cherry, nectarine, peach, plum.

Citrus: Grapefruit, lemon, mandarin, orange, tangelo.

Sub-tropical: Avocado, Chinese gooseberry, feijoa, passion fruit, tree tomato.

Berries: Boysenberry, currant, gooseberry, loganberry, raspberry, strawberry, youngberry.

Others: Grape, persimmon, walnut.

Limitations of the Survey

To avoid unnecessary recording and analysis **minimum** standards to exclude only those plantings too insignificant to affect the results of the survey were laid down.

In the table below **Sole** shows the minimum number of trees or area below which the orchard was excluded from the survey; **Part** shows the number or area of the various kinds of fruit in mixed orchards below which that fruit was ignored; and **Variety** shows the minimum number of trees of any one variety recorded.

TABLE 1—MINIMUM NUMBER OF TREES OR AREA RECORDED

	Sole (Trees or area)	Part	Variety trees
Pip fruit	100	10	10
Stone fruit	100	10	10
Cherry	—	5	5
Citrus fruit	50	10	10
Chinese gooseberry	10	10	
Feijoa, Passion fruit, Tree tomato	50	25	
Berry fruit, Grape	¼ ac.	¼ ac.	

Only tree fruits were listed by varieties.

[*Whites Aviation*

Orchards at Hastings, Hawkes Bay.

Citrus fruits were classified by types rather than variety, though varieties were shown also in most cases. Grapefruit were listed under the types New Zealand, Wheeny, and other. Lemons were listed under the types Eureka, Lisbon, and Meyer.

During the survey the number of varieties of each kind of fruit recorded (695 varieties of 7 kinds of fruit) were:—

Apple 165, apricot 53, cherry 65, nectarine 37, peach 171, pear 77, plum 127.

Classification by Condition and Age

Condition: Within the limits set out above all fruit plants were classified into 3 condition categories:—

A: Vigorous, healthy trees for that district.

B: Trees in fair condition; below A category, but capable in the opinion of the enumerator of being brought back to A condition by better management practices.

C: All trees other than A and B categories. C category was a range of conditions from trees which should be

TABLE 2—DISTRIBUTION OF TREE FRUIT GROWERS BY DISTRICT

District	Total orchards*	Apple	Pear	Apricot	Cherry	Nectarine	Peach	Plum (Europ.)	Plum (Jap.)	Grapefruit	Lemon (std.)	Lemon (Meyer)	Orange
Motueka	119	76	56	1	4	2	7	13	13	—	—	—	—
Mapua	95	89	56	—	2	1	3	9	7	—	2	—	—
Nelson	142	69	48	6	4	23	55	13	33	—	6	—	—
Blenheim	35	23	13	7	2	6	23	4	5	—	3	—	—
Christchurch	165	100	62	37	15	20	37	46	51	—	—	—	—
Timaru and Oamaru	48	19	8	4	2	2	5	2	4	—	—	—	—
Dunedin	33	10	7	—	—	—	—	5	1	—	—	—	—
Roxburgh	102	60	54	66	36	56	67	71	67	—	—	—	—
Alexandra	189	92	97	181	94	126	158	117	117	—	—	—	—
Kaikohe	183	23	6	1	1	5	23	—	12	121	39	91	122
Auckland	491	233	111	2	—	49	276	19	256	268	117	68	61
Hamilton	53	29	19	8	—	6	29	1	15	4	1	1	1
Tauranga	206	9	7	3	—	7	15	—	6	149	130	77	47
Gisborne	74	26	24	15	—	19	38	3	31	32	33	21	42
Hastings	387	263	218	48	19	126	302	72	225	5	10	—	3
Palmerston North	31	18	5	—	2	2	3	1	3	—	—	—	—
Wairarapa	37	7	5	—	—	1	1	1	2	—	—	—	—
Totals	2,390	1,146	796	379	181	451	1,042	377	848	579	341	258	276

* Not tree fruits only; includes all fruits in survey.

pulled out immediately, because of disease, old age, or neglect, to trees in fair condition equal to category B except that in the opinion of the inspecting officer they could not be brought back to A condition no matter how much better treatment was given.

Age: At the same time the plants were classified into one of 8 age groups for tree fruits and 5 groups for sub-tropicals, berries, and grapes. The age was taken from the year of planting and not from the age of the rootstock. The age of trees reworked in the orchard was that from the year of setting out and not from the year of reworking. To date only preliminary figures are available, but these should be sufficiently accurate to give the general patterns and trends.

Table 2 shows the distribution of tree fruit growers by each of the 17 districts as recorded in the survey.

The total number of orchards growing the kinds of fruits recorded was 2390 and of these about half had apple trees, almost half had peaches, and so on down to 181 growers of cherries.

Similarly the columns show the number of growers of each kind of fruit in each district. For instance, there were 263 growers of apples in the Hastings district (out of the 387 orchards recorded there), compared with 233 apple growers in Auckland and 76 in Motueka.

There were 302 orchardists growing peaches in Hastings out of a total of 387 orchards, compared with 158 in Alexandra and 67 in Roxburgh.

The figures in Table 2, however, must not be taken to indicate the number of trees. The table shows merely the number of orchards with sufficient of at least one variety of tree fruits to come within the scope of the survey.

The distribution of the various tree fruits in districts with more than 10 per cent. of the Dominion total recorded is set out in Table 3.

Table 3 cannot be directly related to production, as production per tree varies from district to district; nor can they be related directly to acreage, as planting distances vary also. However, these statistics can be interpreted broadly to show the relative importance in numbers of trees and also to show that only a few of the 17 districts grow the majority of the trees of any one kind of fruit. For instance, over 70 per cent. of the apple trees are grown in 5 districts, 70 per cent. of the peach trees are grown in 3 districts, and 80 per cent. of the apricot trees are grown in Alexandra and Roxburgh.

There are only 4 citrus districts in New Zealand and these are all shown in Tables 2 and 3. It will be seen that Auckland had over half the grapefruit trees, Tauranga had nearly half the standard lemon trees, and Kerikeri grew 60 per cent. of the orange and 37 per cent. of the Meyer lemon trees.

From these same tables it can be seen that in Mapua growers had more apple trees on the average than Hastings growers and in Roxburgh the average number of apricot trees per grower was much greater than at Alexandra.

The relative importance (numerically) of the various tree fruits is shown graphically on page 451 with the fruits strictly in numerical order. Here all lemons are shown in one column with a division between standard and Meyer for comparison.

Similarly, the condition grouping of each kind is shown in Table 4, with pip, stone, and citrus fruits grouped separately. Here Meyer lemons are segregated from standard lemon trees, as they have a different harvesting period and constitute a separate marketing problem.

TABLE 3—DISTRIBUTION OF VARIOUS TREE FRUITS IN DISTRICTS WITH MORE THAN 10 PER CENT. OF DOMINION TOTAL

Kind	N.Z. totals Growers	N.Z. totals Trees 000's	District	Percentage of N.Z. total of trees	Percentage of N.Z. total of growers
Apple	1,146	1,041	Mapua	19	7
			Hastings	16	23
			Motueka	14	6
			Auckland	13	20
			Nelson	10	6
			5 districts	72	62
Pear	796	125	Hastings	38	27
			Motueka	11	7
			Mapua	10	7
			3	59	41
Peach	1,042	301	Hastings	31	29
			Auckland	24	27
			Alexandra	15	15
			3	70	71
Apricot	379	118	Alexandra	44	50
			Roxburgh	36	18
			2	80	68
Plum (Jap.)	848	84	Auckland	36	32
			Hastings	29	26
			Alexandra	10	14
			3	75	72
Plum (Europ.)	377	26	Roxburgh	39	20
			Alexandra	27	31
			Hastings	11	20
			3	77	71
Nectarine	451	27	Alexandra	42	25
			Roxburgh	20	12
			Hastings	16	25
			3	78	62
Cherry	181	21	Alexandra	40	52
			Roxburgh	16	20
			Oamaru	10	1
			Christchurch	10	8
			4	76	81
Grapefruit	579	54	Auckland	55	46
			Tauranga	25	26
			Kerikeri	17	21
			Gisborne	3	5
			4	100	98
Lemon (std.)	341	38	Tauranga	48	38
			Auckland	30	34
			Gisborne	12	10
			Kerikeri	8	11
			4	98	93
Orange	276	31	Kerikeri	60	44
			Gisborne	18	16
			Auckland	14	22
			Tauranga	7	17
			4	99	99
Lemon (Meyer)	253	16	Kerikeri	37	35
			Tauranga	35	30
			Auckland	15	26
			Gisborne	12	8
			4	99	99

TABLE 4—CONDITION GROUPING OF TREE FRUITS IN 1953

Kind	Total trees 000's	Per cent. of all tree fruits	Per cent. A	Per cent. B	Per cent. C
Apple	1,041	55	67	17	16
Pear	125	7	89	7	4
Peach	301	16	76	10	14
Apricot	118	6	79	8	13
Plum	109	6	81	12	7
Nectarine	27	1	72	8	20
Cherry	21	1	67	9	24
Grapefruit	54	3	80	15	5
Lemon (std.)	38	2	61	25	14
Orange	31	2	63	25	12
Lemon (Meyer)	16	1	84	15	1
Total	1,881	100			

Table 4 shows that of the 1,881,000 trees recorded over half were apples and about a sixth were peaches. The condition of trees of all the kinds of fruits was good, only nectarines and cherries showing 20 per cent. or more of condition C. The condition groups of standard lemons and oranges indicate that better management practices could improve the condition and production of a quarter of these trees (B group).

To aid growers to appreciate the potential importance of this survey the accompanying graphs are given to show the Dominion situation for each kind of fruit separately. In each diagram the number of trees in each age group is further divided into condition groups. Reasonable interpretation of these graphs should give a fair picture of the situation for each kind of fruit in 1953 and possibly an indication of the outlook for the fruit industry.

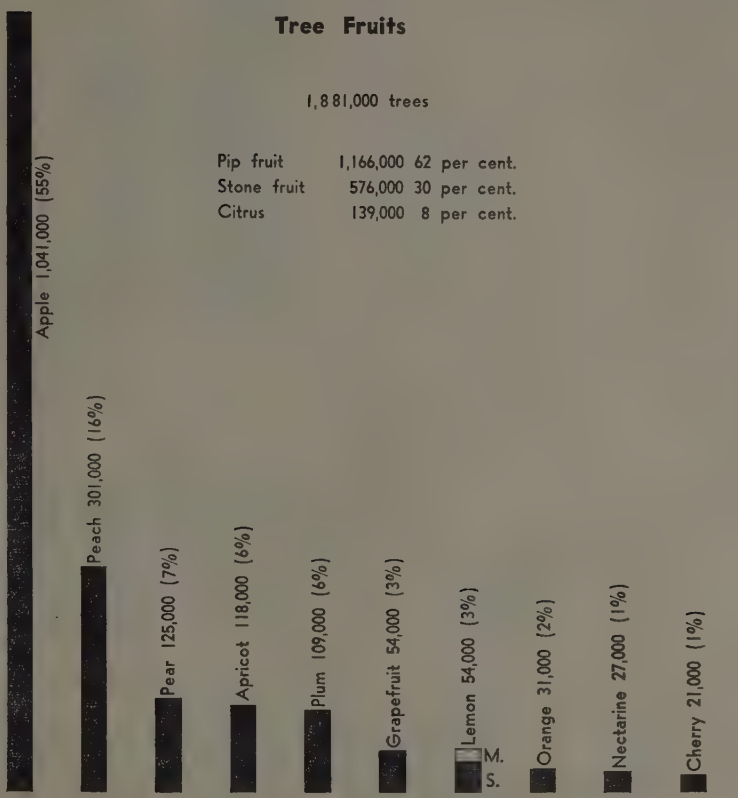
By the age groups it should be possible to predict future production (within broad limits), and the condition groups (the health of the trees) will emphasise or modify what the age groups indicate.

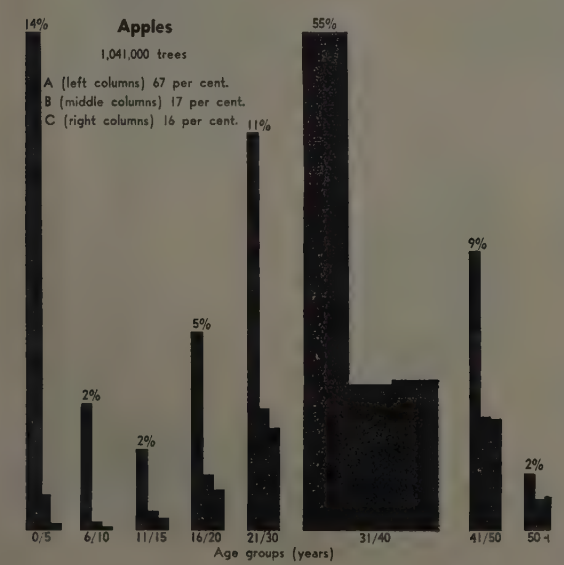
These graphs deal only with kinds of fruit and not with varieties. Varieties vary in productivity both within a district and between districts, so that any prediction as to production trends is based on an assumption that recent plantings are in the same ratio (between districts) as the numbers of mature trees. In general such predictions will be conservative, as the districts with higher production per tree appear to have the greatest number of trees not yet in full bearing.

All the graphs show the age grouping along the bottom; 0/5 means that all the trees in this group are under 6 years from planting and the last column on the right shows the number of trees over 50 years planted. Each column is divided into 3 condition groups A (left), B (middle), and C (right). The relative heights of these 3 groups indicate the health of the various age groups and their potential productive life.

The most important columns are those on the extreme left and right of the graphs. Those on the extreme right should be the first to go out of production and those on the extreme left will increase production. If the number of young trees exceeds the number likely to be cut out, there will be an increase in production.

It is possible to make a rough prediction of future production as a percentage of present production by subtracting the percentage shown for the non-bearing group (0/5 in most cases) from 100 (the New Zealand total). This figure gives the units producing the 1953-54 crop. If, for example, 0/5 is 20 per cent. of the total, the 1953-54 crop was produced from 80 units of trees and there is a potential increase from present plantings of 20/80 or ¼. From this figure must be subtracted the percentage of trees likely to be cut out by the time the 0/5 group comes into bearing. If this figure is 20 per cent., production should remain fairly static; if it is less than 20 per cent., it should increase; and if it is more than 20 per cent., production should be reduced on present plantings.





Apples

The apple industry is in a healthy condition, 67 per cent. of the trees being classified A and only 16 per cent. C. Over half of the trees are in the 31/40 age group; 14 per cent. of the trees are under 5 years and 11 per cent. are over 40 years, but half the latter are in A condition. There should be some increase in productian (up to about 10 per cent.), as it is unlikely that many trees will be cut out because of condition within the next 5 to 10 years.

Pears

In the pear industry trees of all age groups are very healthy. Of the total 89 per cent. are classified A and only 4 per cent. C and it is unlikely that any quantity of trees will be cut out for the next 10 years. If all the trees under 10 years (27 per cent.) are taken to be non-bearing, production for 1953-54 came from 73 per cent. of the trees; there is a potential increase of about 33⅓ per cent.

Peaches

Three-quarters of the peach trees of all ages are A and 14 per cent. are C. Of the Cs over half (9 per cent. of the total) are in the age groups over 20. This is interesting, as it confirms that in most districts the life of peach trees is about 20 years. Note how the number of C in relation to A increases in the 21/30 and older groups.

The 1953-54 crop was produced from some 60 per cent. of the number of trees shown and even if all the trees over 30 years and the Cs in the 21/30 age group are

---

Note: In the graph at left widths of columns have been varied to avoid extreme height of some presentations. Area of columns is the indicator, not height.

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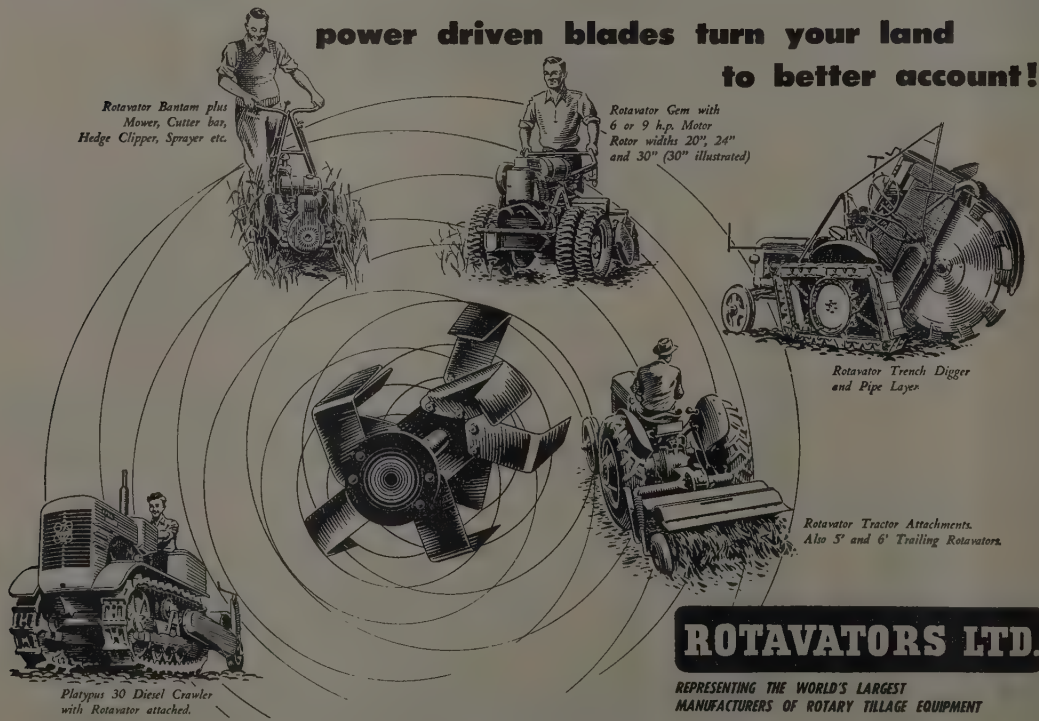

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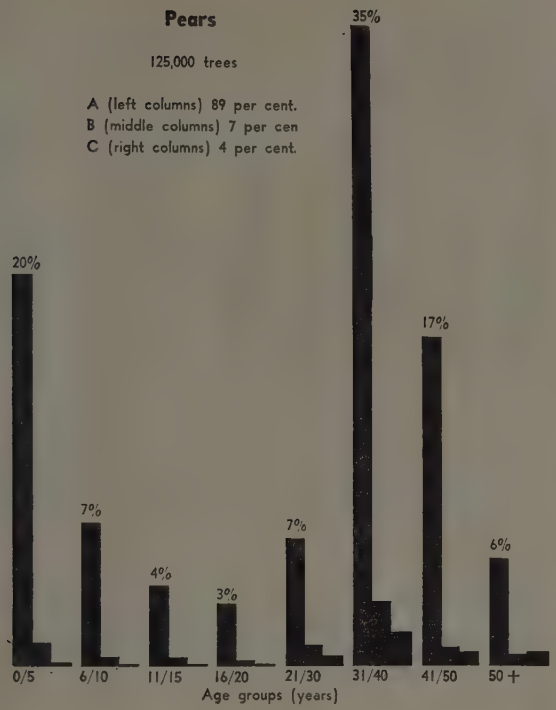
REPRESENTING THE WORLD'S LARGEST MANUFACTURERS OF ROTARY TILLAGE EQUIPMENT

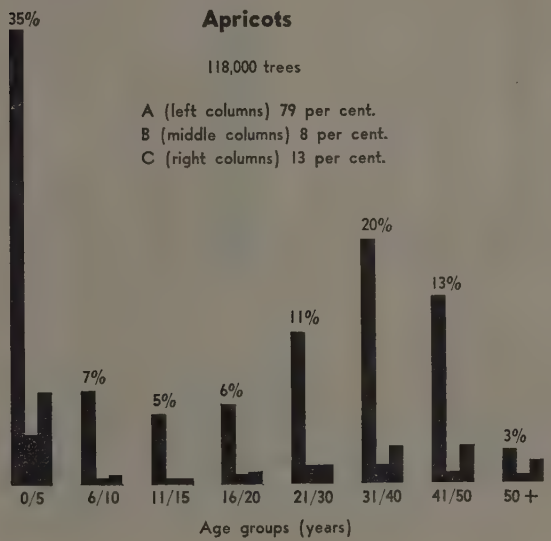


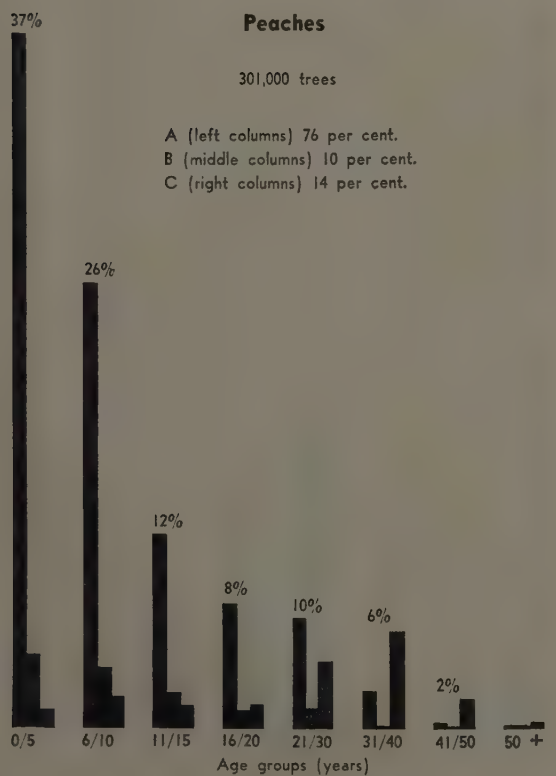
removed during the next few years (a total of about 12 per cent.), the 37 per cent. in the 0/5 group represents a potential increase of $^{25}/_{60}$ or 40 per cent.

Apricots

The apricot situation is quite healthy. About 80 per cent. of the trees are classified A and 13 per cent. C. An interesting point is the number of C trees in the 0/5 group (6 per cent. of the total), probably because of stone fruit blast infection.

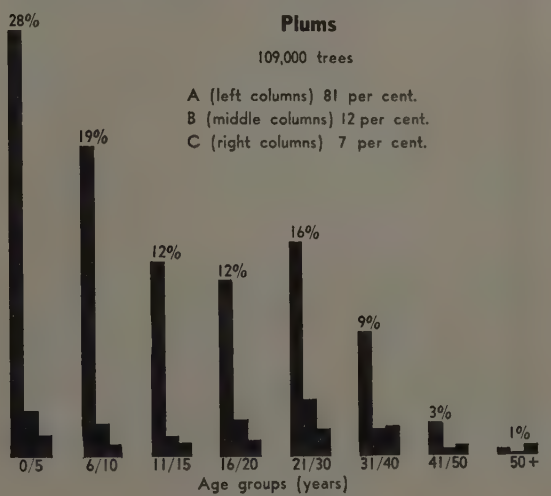
Even if all the trees over 50 years old and all the C condition trees irrespective of age are removed within the next 5 years (a total of some 21,000 trees or 18 per cent.), there is a potential increase in production of $^{17}/_{65}$ or about 25 per cent.

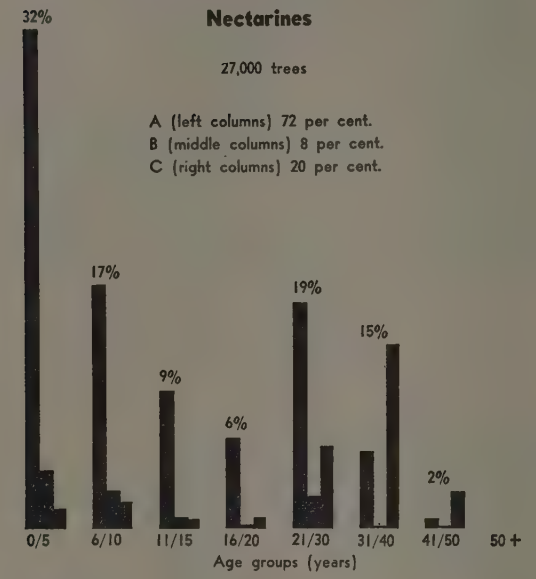




Plums

Plum trees in all age groups are in good condition. The 1953-54 crop was produced from some 70 per cent. of the trees, so there is a potential increase of all plums of more than a third.

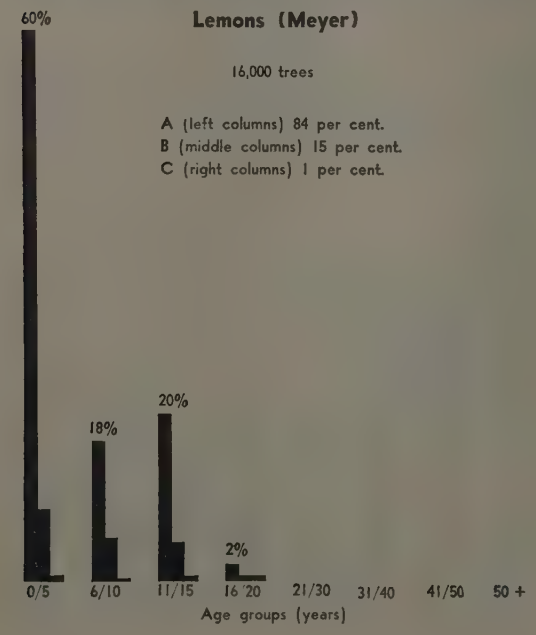


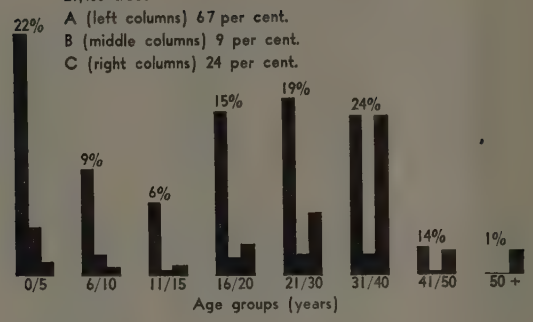


Nectarines

There has been considerable planting of nectarines, about a third of the trees being under 5 years old.

From the graph it seems that nectarines on the average have about the same life expectancy as peaches, as indicated by the relative numbers of trees of C to A condition over 20 years old. Even if all the trees over 40 years old and all the Cs over 20 are removed, there is a potential increase in production of about 20 per cent.



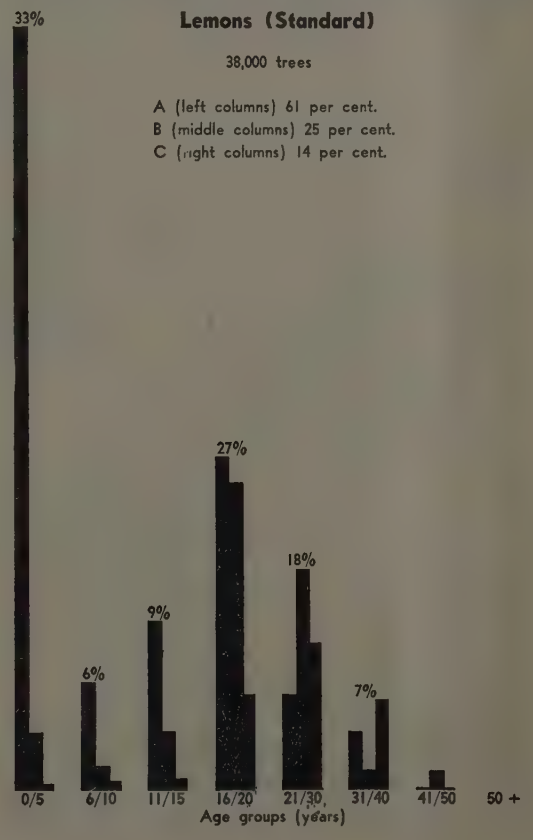


Cherries

About a quarter of the trees are classed as C and these are mainly in the groups over 30 years old. Assuming 10 years as the beginning of worthwhile production from cherry trees and that all the Cs over 30 years old are removed (15 per cent.), production should increase by at least 25 per cent.

Lemons (Standard)

A third of the standard lemons (Lisbon and Eureka types) are under 5 years old, so that even if all the C grade



trees are removed, production could increase by at least 19/67 or 28 per cent.

Lemons (Meyer)

Of the 16,000 Meyer lemon trees 60 per cent. are under 5 years old and only 2 per cent. or 360 trees are over 15 years of age. The over-all condition is very good, 84 per cent. being A and only 1 per cent. C. There is likely to be greatly increased production of Meyer lemons—production could increase to about 2½ times previous crops.

Oranges

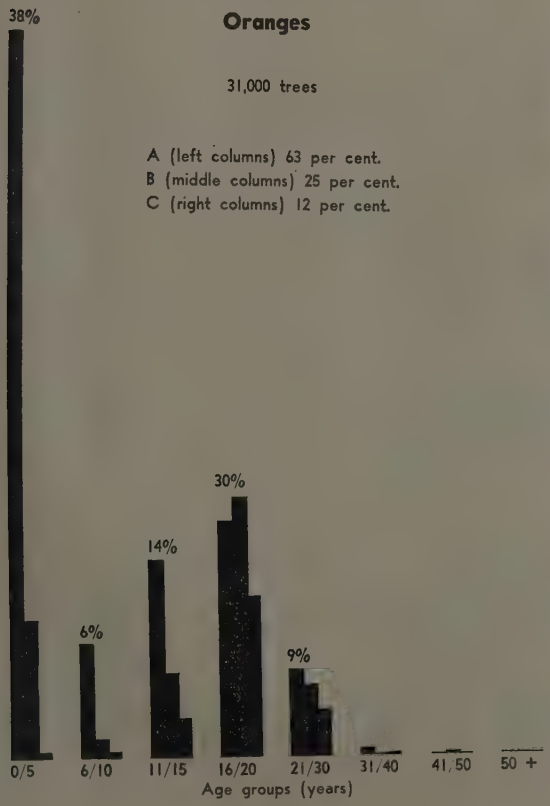
Of the 31,000 trees, over a third are under 5 years old and only 12 per cent. of all ages are classified C. Even if all the C grade trees are removed, there could be an increase from present plantings of up to 26/62 or 42 per cent. above the 1953-54 crop potential.

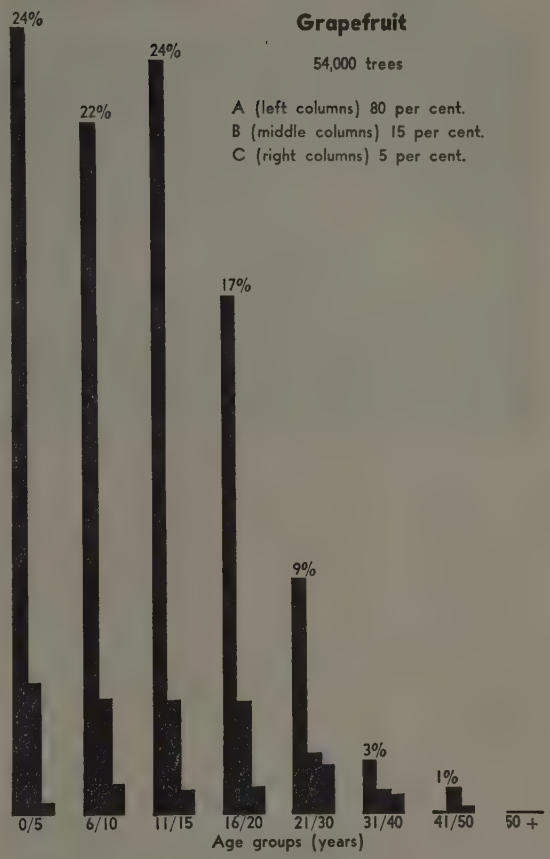
Grapefruit

Of the 54,000 grapefruit trees 80 per cent. are A and only 5 per cent. C condition. If 15 years is taken as the average age when grapefruit trees reach maximum production, 70 per cent. of the trees will be carrying increasing crops in the future. There is no indication from the condition of trees that any appreciable quantity of them will be removed in the near future, so that production is likely to increase to 1½ times or perhaps twice present production.

Final-analysis Patterns

The graphs were compiled from preliminary figures, but it is expected that in the final analysis the patterns will not change appreciably. Further, in the rough interpretation given the increases predicted will be conservative, mainly because no allowance has been made for increasing crops likely to be produced from trees in the 6/10 and 11/15 age groups. In addition in assessing the possible





increase it has been assumed that all the oldest trees and the C grade trees quoted will be removed within 5 to 10 years, whereas in fact the number of trees eliminated will be very much lower and many of the trees in the categories mentioned may still be producing fruit in 20 years time. Similarly no allowance has been made for the possible improvement in the production from B grade trees through better management, which could reasonably occur when growers understand the situation depicted.

The picture of the various phases of the tree fruit industry thus obtained should assist growers and marketing organisations to plan future planting and marketing to ensure adequate supplies for the increasing consumption as population grows, but so that undue surpluses are avoided.

The compilation of statistics and graphs of the main varieties of each kind of fruit is being carried out and will be published. Such detailed information will be of greater importance to growers than the information on kinds of fruit given here.

The situation in 1953 and the outlook for production in each district by kinds and varieties will be made available also. This should help growers to plan future plantings to meet local market needs. Where districts share a major market a study of the situation in competing districts could assist orchardists to maintain reasonable marketing conditions and prices.

Marketing organisations should find the detailed statistics of varieties by districts of use in planning distribution of the crops and they should be in a better position to advise growers what varieties to plant in the various districts for most economical distribution and to meet local and export market requirements.

Care of Livestock during December

Contributed by the Animal Research Division

PIG PRODUCTION

FARROWED sows should receive a daily ration of 4 gallons of milk plus 2/3 gallon for each pig suckled. Newly weaned pigs should not be overfed; 1½ to 2 gallons per day in three feeds is adequate for the first 14 days. The ration can then be slowly raised to reach 2½ gallons at the end of the first month, and after the first fortnight the number of feeds can be reduced to two per day. Replacement breeding stock should be selected from the bacon pens, and only the fastest-growing sows with good strong feet and at least 12 well-placed teats should be chosen.

CARE OF EWES AND FAT LAMBS

As each lot of lambs is sold the mothers should be drafted off together with any dry ewes which may remain in the flock. If feed is short and the ewes have very little milk, it usually pays to wean all the lambs, which can then be given the best grazing available. The ewes should be shorn and those which are to be retained should be placed on short pasture with ample water. This will help to reduce their condition and will result in a better lambing percentage in the following season.

DAIRY COW NUTRITION

Dairy production for the year can be materially affected by feed conditions during summer. Cows fed poorly now not only produce less milk during summer, but will dry off earlier in autumn. Dairy statistics show that long lactation is very important, so the feeding of silage or other supplementary milk-producing fodders should be started as soon as pasture begins to dry off. It should never be left until milk production begins to show a material fall.

COWS RETURNING TO THE BULL

If cows are returning to service, the mating records should be examined to see if any particular bull is to blame. If this is so, it is wise to have a veterinarian or Livestock Instructor collect a semen sample for examination. Care is necessary when purchasing replacement bulls. If possible, a young bull that has not been used previously should be bought. A bull should never be bought in the saleyard unless his full history is known. Washing out cows seldom helps and may cause trouble if irritant fluids such as kerosene are used. It pays to consult a veterinarian as soon as the cows are noticed returning to service in unusual numbers. He cannot be expected to diagnose the trouble months later.

SHEARING

If ewes with lambs are to be shorn, every effort must be made to reduce the time lambs are away from the ewes, as it is easy to dry ewes off at this time of year. They should be brought to the shearing shed in small mobs and should be dagged before reaching the board.

FOOT-ROT CAN BE ERADICATED

Farmers who wish to eradicate foot-rot from their flocks should obtain a copy of Department of Agriculture Bulletin No. 325. This is the season in which the eradication campaign must be planned.

FOWL POX

So-called roup is often fowl pox. Specimens should be sent to the Department of Agriculture Animal Research Station, Wallaceville, for diagnosis. Outbreaks of this disease can be prevented by vaccination, of which full details may be obtained from the nearest Poultry Instructor.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during September and for the 2 months ended 30 September 1954, with comparative figures for the same month and 2-monthly period of 1953, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage Inc. or dec.
September 1954	16,334	289	16,623	—
September 1953	16,030	315	16,345	—
Increase or decrease ..	+304	—26	+278	+1.701
2 months ended 30/9/54	25,610	406	26,016	—
2 months ended 30/9/53	25,458	433	25,891	—
Increase or decrease ..	+152	—27	+125	+0.482

Butter in store at 30 September 1954 was 9,550 tons

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage Inc. or dec.
September 1954	7,223	1,007	8,230	—
September 1953	7,701	11	7,712	—
Increase or decrease ..	—478	+996	+518	+6.716
2 months ended 30/9/54	9,266	1,007	10,273	—
2 months ended 30/9/53	9,351	18	9,369	—
Increase or decrease ..	—85	+989	+904	+9.648

Cheese in store at 30 September 1954 was 8,023 tons

If these figures are converted into butterfat equivalent, there is an increase of 1.767 per cent. in butterfat graded for the 2 months as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

Pasture Management

Seasonal Notes by the Extension Division

GRAZED pastures on dairy farms should not be allowed to become rank during late spring and early summer. Even with the normal reduction in the area available for grazing through fields being set aside for hay and silage patchy rank growth will occur on grazed pastures. This should be controlled by topping the pastures with the mower.

TOPPING PASTURES

Pastures should be topped in rotation in November and early December after grazing. If the quantity of toppings is small, the material will be readily cleaned up by young stock, but if the amount is large, it may be best used as hay. With the forage harvester it is possible to use such toppings for silage. The mower can be used effectively to control pasture growth at other times of the year as well as in spring. If a paddock is to be shut up in autumn for spring feed, it may sometimes have an uneven growth on it which would be better taken off before shutting up, and topping with the mower is a good method of evening up a paddock. Again in spring when autumn-saved pasture is being fed off the mower can be used to good effect to even up a paddock after grazing is completed.

—A. C. BURGESS

* * *

EARLY CUTTING FOR HAY AND SILAGE

EARLY cutting is desirable for both hay and silage fields to avoid damage to the sward and to secure high-quality supplementary feed and a good aftermath. Weather naturally determines the period for haymaking, but with silage as an alternative, harvesting should not be interrupted by the need to wait for suitable haymaking weather. For hay wind is a much better drying agent than the sun, which bleaches the grass and shrivels the clover so that the leaves are lost in harvesting. Turning the hay prevents the sun bleaching and fluffs up the material so that the wind can have a better drying effect. Therefore the swath should be turned not later than the day after mowing and in hot, sunny weather this should be done a few hours after mowing.

If hay is turned frequently enough during curing, it will be dried quickly and will still retain most of its natural green colour and the aroma of freshly cut grass. Rain leaches the sugars and the valuable soluble food from the dried or partially dried grass and clover, and if hay in this condition is exposed to rain for long periods, it may be reduced in value to poor straw. Consequently if rain threatens, partially dried hay should be cocked properly so that the rain is largely shed, even though this adds much to the cost of handling the hay. Whenever rain is likely to fall unturned hay in the swath is better left until the weather is fine.

—P. A. DUNNE

* * *

LUCERNE HAY

THE value of lucerne as a hay crop lies in its reliable high production over a wide range of climatic conditions and soil types and in the nutritious nature of the hay when properly made. Lucerne hay is high in protein and minerals and therefore especially suitable for high-producing stock such as dairy cows. To retain the maximum nutritional value the crop should be cut before the stems become too woody. The crop is at a suitable stage for cutting when new shoots have just begun to grow out from the bases of the plants. The first cut of the season may contain considerable weed growth and should be taken early enough to prevent the ripening of weed seed.

Because the leaves of lucerne contain the greatest food value, every effort should be made to avoid their loss. When stacking was widely practised hay crops were often cocked so that the leaf would not dry out excessively before the crop as a whole was fit for stacking. For the same reason some farmers have a side rake following immediately behind the mower before baling. This practice of raking lucerne into rows while it is still fairly green can be followed with safety only in the drier areas where damage from frequent rain showers is not so great.

—W. F. LEONARD

* * *

STACKING BALED HAY

CONSIDERABLE waste can be caused by faulty siting and building of stacks. A good, dry, level foundation free from danger of flooding is the first essential. A site should be chosen well away from the railway line, where there is risk of fire, and from waterways. The stack should be sited end on to prevailing wet weather or preferably in the shelter of a plantation. If a base of any kind is used, it must be even and allow for a firm foundation layer of bales. This first layer must be placed with the cut edges down to avoid damage to strings. It is preferable for the outside bales to have a slight tilt inward; loose hay packed around the outside will help.

Whatever system of bale placement is used, all layers should be built from the ends to the centre and from the sides to the centre. Any gaps left must be in the centre. The endeavour should be to build perpendicular sides without protruding or receding bales. Each layer should lock the one below it in position so that there will be no danger of the ends or sides of the stack falling outward. It is always wise to have an eave layer, with the outside bales projecting a short distance over the edge of the layer beneath, so that run-off water will tend to fall clear of the sides. Where hay is used to cover the stack the top should have a fairly steep pitch; otherwise water will easily gain entrance, with disastrous results. Care and attention to these basic principles will ensure the safe storage of baled hay.

—J. R. MURRAY

* * *

HARVESTING RYEGRASS AND WHITE CLOVER SEED

CUTTING when the seed is mature is essential if good-quality lines of ryegrass seed are to be obtained. The seed should separate from the heads on pressure from the hand, and greenness should be gone from the bulk of the straw. Samples for blind seed examination sent to the Department of Agriculture at this stage will give an indication of disease incidence and stage of maturity. Windrowing with either the mower or binder is general, though with Italian and short-rotation ryegrasses stooking reduces harvesting losses, especially if there is adverse weather.

Under average conditions perennial ryegrass is fit to thresh after a week in the windrow, but heating troubles are likely to arise if Italian or short-rotation ryegrass is threshed less than 14 days after cutting. Drum speed and concave settings should be to the maker's specifications. Any modifications necessary due to varying conditions should aim at the minimum drum speed and maximum concave opening to give efficient threshing.

Similar principles apply to the harvesting of white clover. The crop is fit for cutting when most of the well-filled heads are ripe and can be easily rubbed out. An even swath with sufficient body to be picked up readily by the header should be aimed at, and excessive bulkiness which would delay conditioning should be avoided. To avoid losses through cracking or incomplete harvesting the swath must be fit before threshing is attempted. Periodical examination of the sample and cavings will determine optimum header settings as for the ryegrass crop.

—M. L. CAMERON

Sheep Feeding Rack which can be Easily Moved

By S. M. J. STOCKDILL, Fields Instructor, Department of Agriculture, Dunedin

WITH the object of overcoming some of the difficulties associated with the feeding of hay to sheep in fixed racks Mr. A. C. Drake, of Maungatua, has designed portable racks of the type illustrated on this page.

THE racks are 12ft. long, of simple construction, and built of New Zealand Oregon at a cost of approximately 35s. each. The material required for each rack is 45ft. of 4in. x 1in. and 9ft. of 10in. x 1in. timber, 24ft. of 3ft. centre strand 4in. mesh sheep netting, 6ft. of window cord, and nails and staples. The 10in. opening at the top of the rack is sufficient for easy filling with hay, and the almost vertical sides minimise the possibility of seed falling into the wool of the sheep. Each rack will hold 2 bales of hay in slices or 1½ bales teased out. The portable hay shed used with the racks should be on runners and large enough to accommodate 3 days' supply of hay. It could with advantage be built 12ft. 6in. long so that it could be utilised to store the racks when they are not in use.

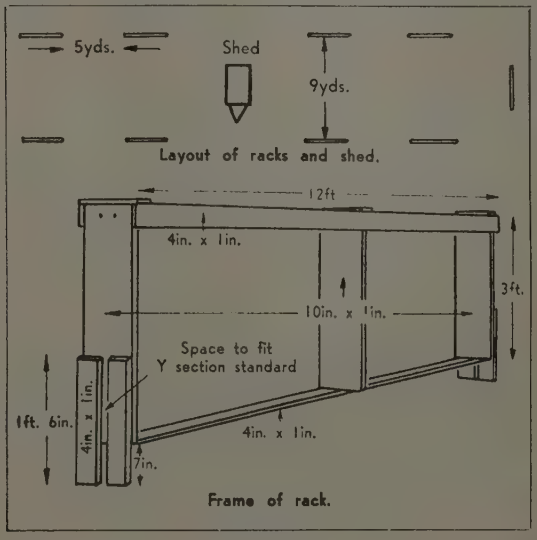
Layout of Racks

Nine racks set out with the portable hay shed as shown in the plan provide a feeding area of 216ft. and have proved satisfactory for the feeding of 500 to 600 ewes. About 1 hour is required at the beginning of feeding to set out the racks with the shed full of hay. For the following 2 days the racks are filled from the shed, and on every third day the layout is shifted on to new ground and the shed refilled.

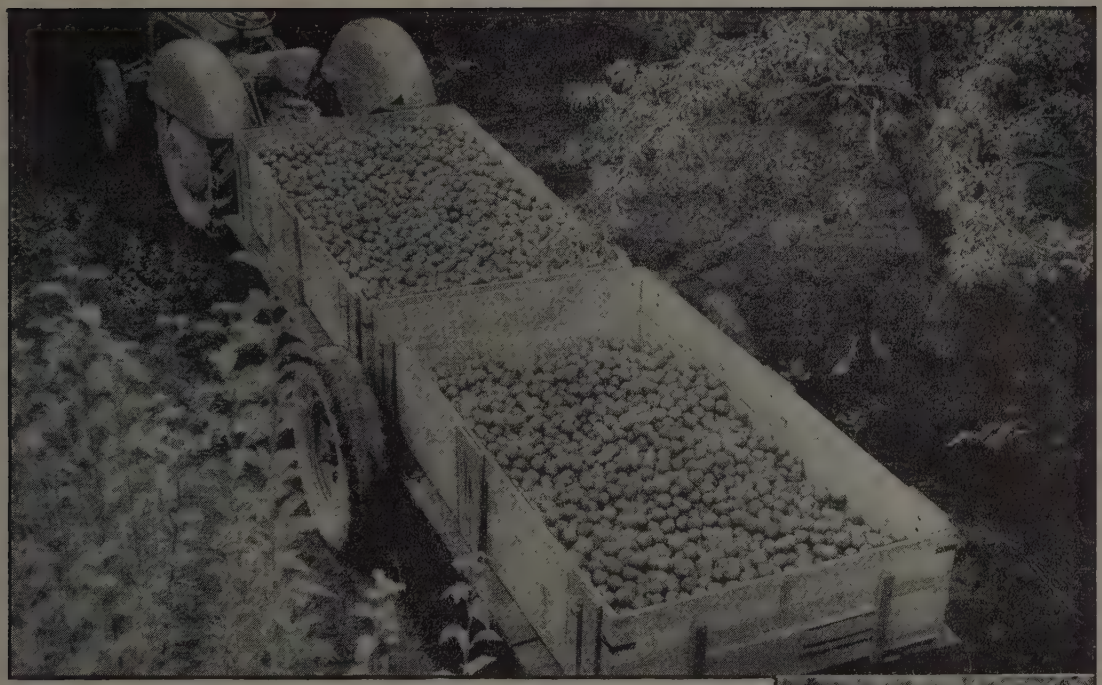
Fixing Racks in Position

Each rack is held in position by two Y section standards, one at each end, driven in between the legs at the base and tied at the top with short lengths of window cord. Shifting is quickly and easily done by untying the cord and pulling back the standards, dragging the rack forward as illustrated, and replacing the standards. The nine racks and shed can be shifted and the shed filled with hay in ½ hour. Rotation of the racks around the paddock in this way avoids severe poaching of the pasture, enabling the operator to work on clean ground and the sheep to be fed on clean ground. The quagmire normally caused by the concentration of stock near fixed racks is avoided, and instead of the usual concentration of animal droppings where very little growth is possible there is a more even distribution over the entire paddock as the racks are shifted from place to place.

The portable hay feeding rack. Upper—Pulling back a Y standard to release the rack for shifting. Inset—When the rack is in position the top of the Y standards are tied with short lengths of window cord. Lower—The rack is easily shifted by this method.



The portable shed on skids should be able to hold 3 days' supply of hay.



Bulk Handling of Fruit

FRUIT growers are always interested in ways of saving labour costs and perhaps at the same time taking some of the hard work out of fruit growing. To this end mechanisation plays a big part, and a recent trend is toward various forms of bulk handling of apples and pears. In this article T. Conway, Horticultural Instructor, Department of Agriculture, Hastings, describes an effective bulk handling system installed by a Hawkes Bay orchardist.

ABOUT 15 months ago a Hastings fruit grower, Mr. E. J. R. Milne, went to Nelson to obtain details of the effectiveness and design of a fruit handling system employed by a Nelson grower and which was described in the December 1953 issue of "The Orchardist of New Zealand" by G. S. Northcote, Horticultural Instructor, Department of Agriculture, Nelson. As a result Mr. Milne has now installed bulk handling equipment on his own orchard based on the Nelson grower's principle but with, he feels, many improvements. The equipment consists of:—

1. Twenty-four wooden bins each having a capacity of approximately 50 bushels of apples.

2. Three low, flat-bottomed tractor trailers.

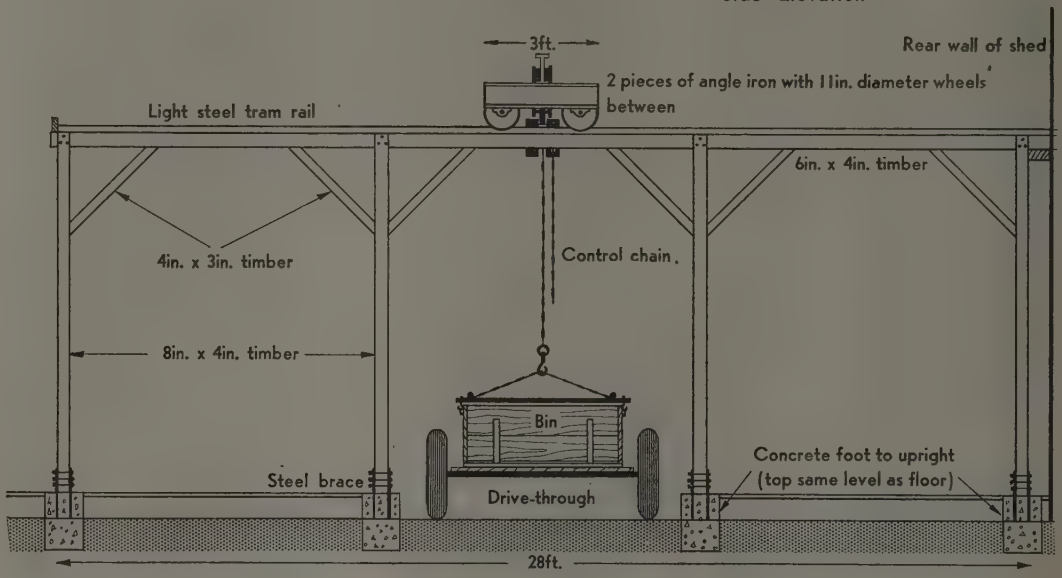
3. Hoist and gantry on rails for handling the bins in the packing shed.

Mr. Milne's orchard is not in one compact unit and fruit has to be hauled some distance from one of the orchard areas. The number of bins not only facilitates the work on his two orchards, but is important in providing the means of assuring ample reserve stocks of fruit in the packing shed if the weather is wet. Probably

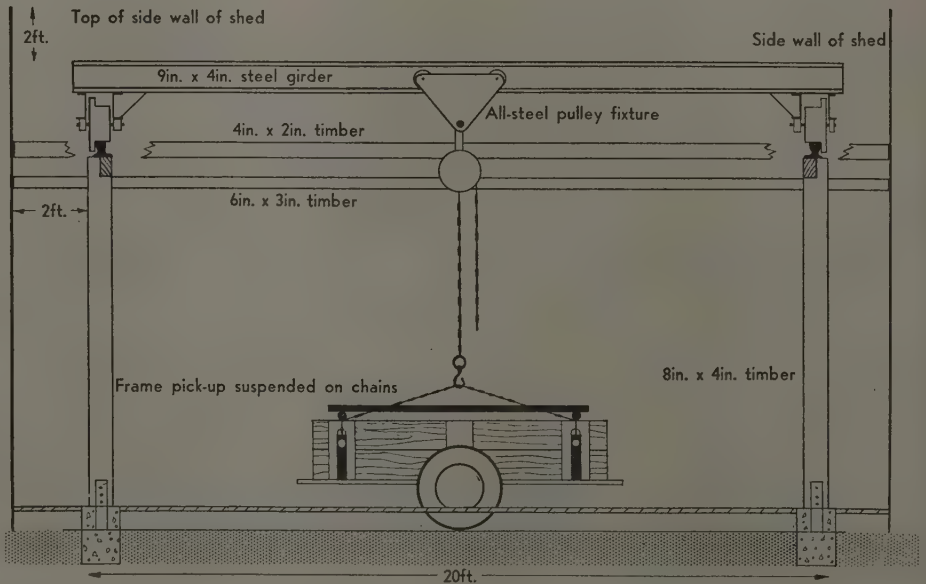
Upper—The large bins on the trailer partly filled with Winter Cole pears. Lower—Pickers emptying their bags of fruit into the large bins. The easy position for careful handling and avoidance of damage is shown. If desired, a second layer of bins can be added for filling; pickers then empty bags from stools.

Details of Bulk-handling Equipment

Side Elevation



End Elevation

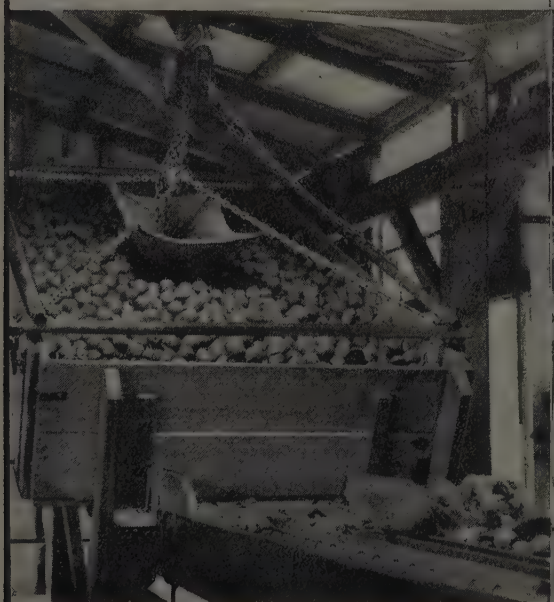


All the timber is Oregon pine and all timbers are bolted together.

BULK HANDLING IN PACKING SHED

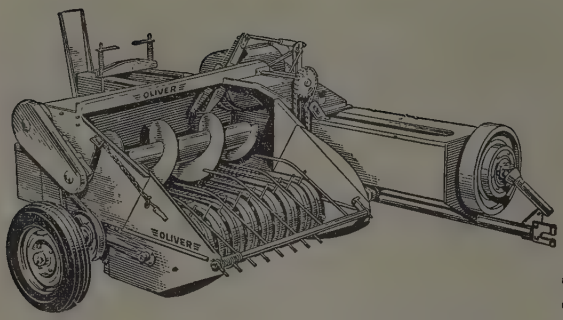
1—On arrival at the packing shed the bins are lifted with a pulley hoist and are moved to the grader or stacked four high as a reserve supply.

2—Bin being hoisted on to the counter-balanced tilting tray for feeding of fruit to the grader.



3—Bin in position at end of grader bench awaiting removal of the slide opening to start the flow of fruit.

4—The slide opening is removed and the fruit flows steadily past the grader. The turning rollers of the grader bench keep the fruit moving.



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[*R. W. Orr*

Spreader or frame attached to a bin ready for lifting. There are single-link attachments between the corners of the frame and studs on the bins. These studs are old aeroplane parts made of high-tensile steel.

one trailer and 12 bins would be sufficient for most orchards, especially at first.

Reinforcing of Bins

The bins are constructed of 1in. timber and are 8ft. x 4ft. x 1ft. 6in. To prevent spread of the bin when it is filled it has been found necessary to reinforce it with three flat iron bands running down one side, across the bottom, and up the other side; there is one band close to each end and one mid-way between the ends.

Each trailer platform is approximately twice the size of one bin so that two bins can be carried and filled in the orchard from the pickers' bags without disturbance. If desired, a second tier of bins can be placed on the bottom bins when they have been filled. To facilitate emptying of bags into the top tier a low set of steps is provided for pickers alongside the trailer. The empty bins are easily handled by two men.

The hoist in the packing shed consists of a pulley and endless chain mounted on wheels on a gantry running on steel rails. The rails are mounted on heavy timber supports about the same height as the shed walls and running along each side of the shed from the end of the shed to about level with the middle of the sorting table. With the gantry movable lengthwise in the shed and the hoist movable crosswise on the gantry it is a simple matter to take full bins direct from the trailer to the grading table or to stack them up to four high alongside the table. Empty bins are stacked across the end of the shed.

There are two doors to the shed (one on each side) with a driveway through the shed just behind the grader bench. This allows tractors and trailers to be driven into the shed behind the grader bench for discharge. Along one side of the grader there is considerable shed space for the storage of full bins of fruit, which are placed in tiers three or four deep.

To avoid undue strain on or twisting of the bin when lifted full a spreader or frame, made of old cool-storage piping, with hooks at each corner to attach to the corners of the bins, is used. It is attached to the pulley by short chains.

Method of Operation

The full bin is lowered on to a frame which is in the position formerly occupied by the hopper. Beneath the frame is a system of compensating weights, finely adjusted so that as the weight of the bin settles on the frame the bin slowly tips forward to the maximum tilt required to discharge the fruit on to the grading bench. The removal of a slide from the front of the bin provides a well bevelled and oblong opening about 2ft. wide by 7in. deep through which the fruit moves at a suitable even flow on to the grader. Only occasionally is it found necessary to give the bin a light knock to keep the fruit moving. As the bin is emptied the compensating weights return it to level in readiness for replacement with another full bin. This operation takes one man about 3 minutes, a full bin being lifted directly from a trailer or from reserve supplies on the shed floor. The empty bin is placed on the trailer for return to the pickers or taken across the driveway to the end of the shed away from the grader.

It is intended shortly to replace the manual operation of the hoist with an electric motor.

Record Crop Handled

The equipment is well constructed and is effective and efficient in operation. It has now had a thorough test with a record crop for this orchard of some 20,000 cases of apples and pears. There is no doubt that the installation is operating efficiently. Mr. Milne and his sons are enthusiastic about the results and are convinced that it will prove an asset on any property where fairly large quantities of fruit are handled. Even with a soft variety, such as Golden Delicious, there was less bruising than with normal methods of handling.

Summarised, the advantages are:—

Much less bruising occurs than formerly because of less handling.

Time and hard work are saved because of the elimination of picking boxes.

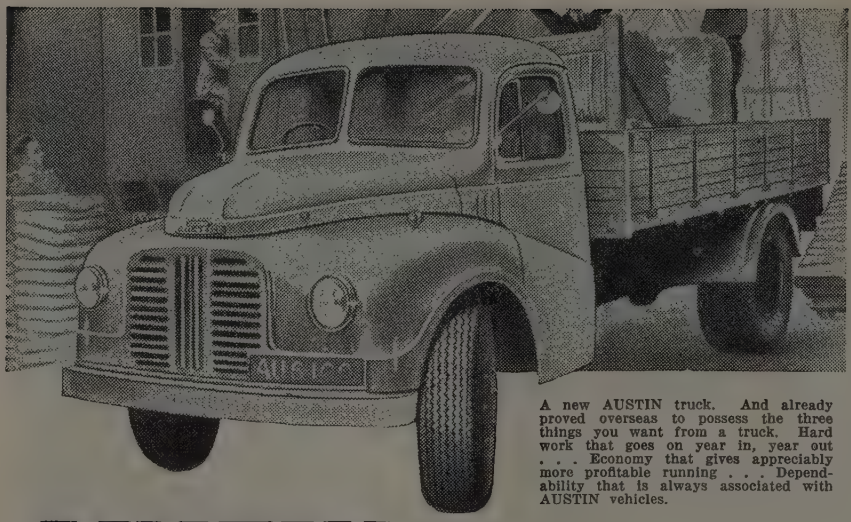
No damage results from over-filled picking boxes.

Ample reserve stock can be assembled in the packing shed.

Good utilisation of shed space is assured.

The material for the hoist, runners, and bins cost about £300. To this must be added the cost of making the trailers, plus the time spent on the construction and assembly of the equipment, which was done by the grower and his sons.

This is obviously a really worthwhile development, the success of which must be of considerable interest to fruit growers in Hawkes Bay and elsewhere.



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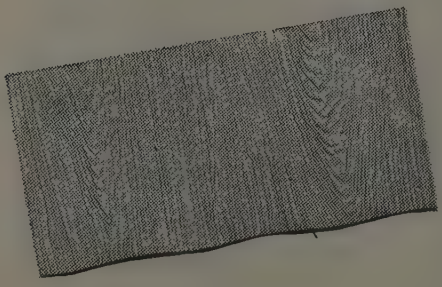

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Use of Artificial Light for Winter Egg Production

WITH the call for increased efficiency in the poultry industry it is essential that a greater proportion of eggs be produced in autumn and winter, and this article by J. H. Jones, Poultry Instructor, Department of Agriculture, Oamaru, gives a guide on the use of artificial lights for this purpose.

TODAY the greater proportion of winter eggs are produced by the large commercial poultry farms, and the use of artificial lighting during winter plays an important part in this production. To achieve more stability in the poultry industry, and small fluctuations in the price of eggs, it is desirable that as many poultry farmers as possible should install some form of lighting system, as there is no doubt about the efficacy of such lighting. The more even annual egg production is the less will be the need for holding eggs in cold storage and for the manufacture of egg pulp, and the easier it will be to maintain a steady flow of good-quality eggs to the egg floors. Eradication of the steep price fluctuations will appeal to the consumer and should result in increased consumption. It is difficult to encourage the public to use more eggs when there are alternating periods of shortage and over-production.

The artificial lighting at night of poultry flocks is unnecessary for egg production, and cannot be proved to have the effect of increasing total yearly output. The importance of artificial lighting is mainly to increase winter production, the working day being extended to 13 to 14 hours; feed is made available during these extra hours, resulting in greater consumption.

Lighting stimulates the pituitary gland to produce more follicle-stimulating hormone, thus leading to greater development of the ovary, and the extra food consumed provides the nutrients required for increased egg production.

Lighting for Breeding Flocks

If a system of trapnesting, progeny testing, or selecting breeders by their winter egg production in their pullet year is in use, it is not advisable to use lights for birds that are to be bred from the following year, as they make poor or mediocre birds appear better than they are and can interfere seriously with the selection and breeding programme. The breeder needs to find pullets which can lay well without the stimulus of artificial illumination. For breeding flocks lighting is not detrimental, but it is not considered sound to provide light for the birds until approximately a month before the eggs are to be used for hatching.

Lighting for Commercial Laying Flocks

To secure maximum returns it is important that stock be graded and grouped according to age and condition. Pullets of different ages and pullets and hens should always be kept in separate flocks. Lighting for pullets should not be begun too early; from about the first week in March to the first week in April is fairly safe. Beginning with lights before this brings on heavy production in early autumn, making it almost impossible to hold the birds in high-producing condition during winter. The few early eggs gained by the earlier starting of the lights are more than offset by inevitable winter production slumps. However, the age and breed of the pullets must have a bearing on the time of year to begin using artificial lights. With early-hatched birds the first sign of a partial or neck moult is a good indication that the time has come for their use.

Various Systems

A number of systems of artificial lighting have been advocated by authorities. Some recommend a bright light for a short period; others a dim light for a longer period. However, for the usual type of New Zealand flock house the general recommendation is to use a 60-watt bulb for a 16ft. x 12ft. compartment housing approximately 50 birds, or approximately 1 watt per bird. In a 100-bird compartment the use of two 60-watt bulbs in separate sockets which hang from the roof on a short length of flex is recommended. The non-rigid type of socket lessens the risk of bulbs being put out of order by flying birds and accidental collisions by the attendant and others. Very often when a time switch is being used which automatically switches the lights on and off, the first indication that a light has been fused is reduced egg production from the pen. Layers respond to lights in from 7 to 10 days, and in about 2 weeks the effect of removal of these lights will be shown by a sharp drop in egg production, which may take several weeks to pick up again.

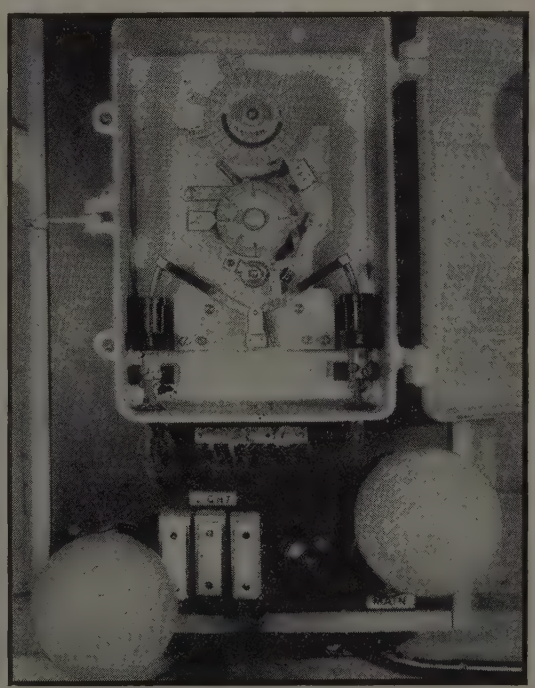
Beginning of lighting should be gradual. The first week the time switch should be set for 5 a.m., the second week for 4.30 a.m., and finally for the third and subsequent weeks for 4 a.m. Regularity in the use of light is very important and once started they should be used all winter without interruption. There is no need to change the feeding mixtures when lights are being used. Some farmers leave mash or pellet hoppers open and others prefer to put down a feed of grain or pellets in troughs or in the litter after the birds have gone to roost. Fresh water should be available at all times.

Types of Lighting

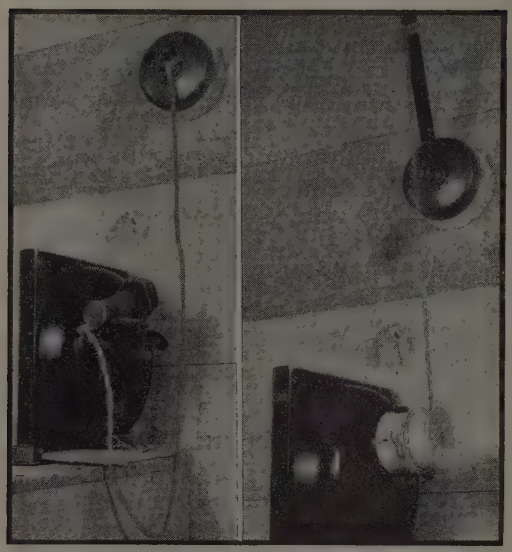
Fluorescent lighting has been successfully used for this work. These lights use less than half the amount of current required for ordinary lights, but because the cost of installation is two to three times greater than that of ordinary lights, and because of the harsh treatment to which lights may be subjected in a poultry house, expenditure on the fluorescent type is hardly worth while.

A suitable lamp is one hanging in a wide aluminium, bronze-coated reflector, but any reflector that will deflect the light on to the birds is better than none. Lighting should be such that the perches as well as mash hoppers, water containers, and other equipment are illuminated. The height of a lamp in the centre of the compartment should be approximately 6ft. above the floor, or if there is more than one, they should be so spaced that the distance between lights is twice the distance from the end lights to the ends of the compartment.

A dull light may be used during the whole night for illuminating the mash



An orthodox type of time switch.



Time switches improvised with alarm clocks. Left—A weight balanced on the alarm key is dislodged as the key unwinds. Right—A cotton reel slotted on the alarm key winds down the extension tube on the light switch when the alarm operates.

hoppers and water bowls only. For this a 20-watt bulb is sufficient.

According to C. S. Platt, of Rutgers University, United States of America, dim red lights are most beneficial for egg production. Tests were made with 30-week-old White Leghorn pullets housed in groups of 50 from 5 October to 31 March (in New Zealand March to September). During the winter one flock received no artificial light, another had one 60-watt white bulb per 200ft. of floor space lighted from 3 a.m. until daybreak, and other groups had red light from dim, 10-watt bulbs for various periods during the night. All parts of the perches were within 3ft. of a red bulb. The hours of lighting tried for the red lights were 8 p.m. to midnight, 8 p.m. to 4 a.m., and 6 p.m. to 6 a.m.

All groups were fed a standard layers' mash, which was available at all times, plus grain in hoppers for 1 hour late in the afternoon. Winter egg production was maintained at a higher rate in all the lighted groups than in the unlighted group, the greatest improvement being noticed in the group exposed to 8 hours of dim red light. These lights were so dim that the pullets did not leave the perches until daybreak.

In contrast is an experiment in Switzerland in which good results were achieved with "shock" illumination—1500 watts for 20 seconds at 4 a.m. and at 4.45 a.m.—as from night lighting from 4 a.m. onward with 75-watt bulbs.

Time Switches

For the commercial poultry keeper an automatic time switch to turn the lights on and off is recommended, as these, if of a good make, are almost infallible and require little attention other than a weekly winding. If, however, the size of the flock does not warrant this expense, an efficient time switch can be constructed with an ordinary alarm clock. Two examples of such use are illustrated.

If lights are to be used in the evening, some type of dimming device is required to get the birds back on the perches, one system being to provide a dim, 15-watt pilot light which is switched on when the main lights go out, enabling the birds to find the roost. This light is switched off by the attendant on his round in the morning.

For poultry keepers not supplied with electric power, pressure kerosene lamps can be used successfully. A 300-candlepower lamp suitably shaded will illuminate 400 to 600 sq. ft. of floor space. Naturally with this type of lighting it is necessary to take strict precautions against fire. At least 2ft. of space should be left between the top of the lamp and the roof of the poultry house. One advantage of the pressure lamp is that as the air is used up the lamp automatically dims itself, and when it is finally removed in the late evening the birds are on the perches.

Precautions with Installations

As with all electrical appliances on the farm the installation of electric lights in poultry houses should be undertaken only by registered electricians and the local power authority advised of the intended work. Installation by amateurs in sheds which sometimes are far from weather proof can easily lead to risk of fire and possible loss of human life.

Provided that attention has been paid to general good management of the flock and that the stock are of good quality, there is nothing difficult in the installation of lights. The main points to remember are that whatever system is used it should be kept to regularly during the whole winter and food and water should be regularly provided. Lights, of course, will not in any way improve the condition of poor birds. They will only increase the winter production of birds which have a good inherited laying capacity.

Management of Contour Irrigation Ditches

CONTOUR irrigation is confined mainly to hillsides and easier slopes of 3ft. or more of fall per chain. If the water supply is reasonably adequate, more efficient management can be achieved by satisfactory race gradient, cleaner races, and an improved contour system. Distributory systems on many farms can be improved rapidly and easily and every effort must be made to use available water. Supply races are generally satisfactory, but many contour ditches have been put in on a low gradient. This can be useful at times, but unfortunately low gradient races will not deliver water readily, siltation occurs, seepage is accentuated, rush growth is likely to predominate, and water weeds will become a bigger problem. An excessive length is frequently associated with these races and consequently irrigation is poor and slow. Clean races free of trailing grasses and water weeds assist materially in the delivery of water and ease of irrigation. Much water is wasted in irrigation through loss down natural waterways and could and should be re-utilised if topographically possible.

Aim of Management

Management should aim at the co-ordinated use of water, race gradient, cleanliness, and an improved system. Water previously lost from use can often be used again by the strategic emplacement of dams. Bulk supply can be diverted to other areas for re-use. Alternatively this water may be picked up in gullies and depressions and redirected, augmenting supplies from higher sources. Sluggish races can be realigned to a steeper grade giving better delivery. Races with a 2in. to 6in. fall per chain and race lengths of 5 to 12 chains respectively are satisfactory for delivery, whereas depth between races will vary with fall.

T.C.A. is effective against grassy weeds on banks and race beds and can be applied at 100lb. or more per acre race length. Care should be taken to apply this material at least 6 weeks before the beginning of the irrigation season. Burning dry grass before application will allow better penetration of the T.C.A., which is best applied as a spray. This method of control eliminates race disturbance and in stony country eases seepage, indirectly assisting in sealing.

Every farm has its topographical problem of irrigation, and advice should be sought in planning a new scheme. Levelling of any area under the plough for pasture renewal is possible on easier contoured country and will help considerably in the application of water. Permanent turnouts can be installed, and greater use of level contours to back up and spread water on a wide front should be considered. Improved techniques of pasture utilisation must proceed hand in hand with contour management.

—*R. C. SCHOFIELD,*
Instructor in Agriculture,
Department of Agriculture,
Alexandra

Home Orchard in Summer

THE home orchardist looks forward to summer, as then he hopes to see in a good crop of clean fruit the results of his efforts during the year. To be a successful grower of high-quality fruit he must attend to all aspects of fruit culture. During the growing season the most important job is spraying for control of pests and diseases, but other aspects, particularly care of young trees and cultivation, must also receive attention, and here N. B. Congdon, Horticultural Instructor, Department of Agriculture, Hastings, advises on correct methods for these important aspects of orchard management.

TOO often one sees in a home orchard trees which have been allowed to crop too soon. A grower's enthusiasm to take fruit from a young tree before it has reached a satisfactory age usually results in a stunted or lopsided tree incapable of carrying heavy crops. Stone fruit and pip fruit trees particularly require attention in this respect. Some varieties, if allowed to do so, will begin cropping at a very early age to the detriment of growth and tree vigour. During the first few years of its life a tree should be allowed to crop only to the extent that growth and development of the framework of the tree are not impaired. The following is a guide as to the age from planting at which trees should be allowed to begin full cropping:—

	Years
Peaches, nectarines, and plums	4
Citrus and apricots	5
Apples and quinces	6
Pears	7

To prevent young trees from bearing, blossoms should be rubbed off during the flowering period or fruitlets removed after they have set.

Watering

The effects of drought conditions during summer are aggravated by a light soil, which will require more watering than heavier soils. Young trees, being not as deep rooted as fully grown trees, will react to dry conditions much earlier and will require more frequent waterings. Both with young and older trees irrigation should begin at the first signs of drought. Trees should never be allowed to become obviously wilted before water is applied, as a severe check may result, and in bearing trees the crop may be seriously affected. During dry periods water should be applied often and evenly over the ground, care being taken that the soil is saturated. Wetting the top few inches is useless. Citrus trees require more water than other fruit trees, particularly when they are growing on a lawn and are competing with grass for moisture. Water should be applied to citrus trees well out from the trunk to ensure that the entire root zone is supplied.

[*Sparrow*

If attention is paid to all aspects of fruit culture, there is no reason why a home orchardist cannot have plenty of fruit of good quality.

Cultivation

Young trees particularly should never be subjected to competition from summer weed growth for long periods. Cultivation of these as well as bearing trees should be in the form of frequent shallow cultivation, deep enough to remove weeds but not deep enough to injure surface-feeding roots of the trees. If the area is sown down with grass, a circle or square at least 6ft. across should be cultivated beneath each tree.

Mulching of fruit trees is excellent, since it serves several purposes:—

1. By preventing evaporation from the surface it helps to retain soil moisture.

2. It helps to suppress weed growth.

3. The mulch breaks down into humus, which improves soil conditions, makes food material more readily available, and thus helps to build a healthy, vigorous tree.

Lawn clippings, old hay, or vegetable refuse are quite suitable for mulching and should be spread round trees after the soil has been well worked up in spring. The mulch can be continually added to during summer. When turned in in autumn it will prove of great benefit in helping to build up soil fertility. Care must be taken to ensure that the mulch is away from trunks, particularly of citrus trees, owing to the risk of infection by the collar rot fungus.

Staking and Shelter

The home orchardist is not always able to choose the most suitable site for his trees. They are therefore often subjected to unfavourable conditions at certain periods of the year.

Normally young fruit trees should not require staking after planting out, except where they may be subjected to strong winds. However, those trees which have weak or shallow root systems will require support at least until they become well established, and some may require a permanent support. This would apply particularly to apple trees propagated on East Malling IX (dwarf) stock and to tree tomatoes grown as seedlings. Stakes should be driven well into the ground on the windward side of the tree and a soft, strong material used for tying the trunk to the stake. Ties should be left loose enough to allow normal growth and should be checked occasionally to make sure they do not become too tight.

Good shelter is important for all fruit trees during the growing season. Wind damage to fruit and foliage can nullify all efforts to produce good fruit. Citrus and most sub-tropical fruits need shelter more than most

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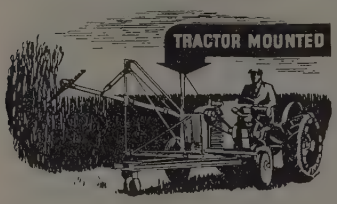

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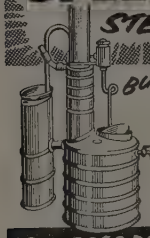

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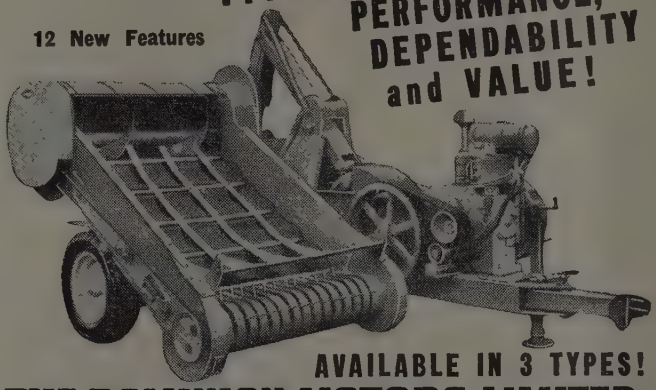

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other kinds of fruit. When a home orchard is being established the aim should be to have a permanent hedge 8ft. to 10ft. high on the windward side of the section to protect the trees when they are fully grown. While the permanent shelter is growing it may be necessary to provide temporary protection for the young trees by using scrim or hessian screens supported on a wooden framework.

Propping of heavily laden branches may be necessary later in the season as the fruit is approaching the harvesting stage. Breaking of main limbs can be avoided by using forked props at suitable intervals around the trees.

Spraying

The article "Home Orchard in Spring" in the August 1954 issue of the "Journal" gave information on spraying and important points about the application of sprays. The same article dealt with the aims and practice of fruit thinning.

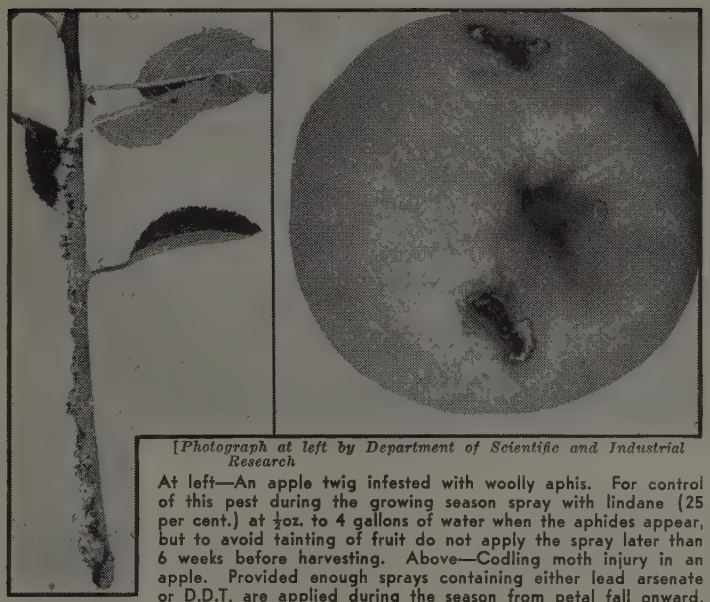
The home orchardist may apply to the nearest Horticultural Instructor for detailed spray programmes covering the whole season. Here reference is made to the main diseases and pests attacking various fruit trees from November onward and the measures generally adopted for their control.

Peaches, nectarines, plums, and cherries: Brown rot, leaf-roller caterpillar, and pear slug (a chewing insect found on plum, cherry, and pear foliage) are the main troubles.

To control brown rot spray with lime sulphur (3 fl. oz. to 4 gallons of water) plus colloidal sulphur (1¼oz. to 4 gallons of water) at 14-day intervals until about 1 week before picking.

From this month onward for control of insect pests add to this sulphur mixture three times during the season D.D.D. (1¼oz. of the 25 per cent. material to 4 gallons of water) or basic lead arsenate at ⅔oz. to 4 gallons of water. Either of these should control the insect pests mentioned, but D.D.D. or lead arsenate should not be applied later than 1 month before harvesting owing to possible residue remaining on the fruit.

At the first appearance of aphis on young foliage add to any of the above sprays lindane (25 per cent.) at ½oz. to 4 gallons of water. Lindane should be used only in the early part of the season, as if it is applied later than 5 or 6 weeks before harvesting, it may cause tainting of fruit.



[*Photograph at left by Department of Scientific and Industrial Research*

At left—An apple twig infested with woolly aphis. For control of this pest during the growing season spray with lindane (25 per cent.) at ½oz. to 4 gallons of water when the aphides appear, but to avoid tainting of fruit do not apply the spray later than 6 weeks before harvesting. Above—Codling moth injury in an apple. Provided enough sprays containing either lead arsenate or D.D.T. are applied during the season from petal fall onward, codling moth should not cause great worry to home orchardists.

Apricots: As apricots are intolerant of sulphur sprays, brown rot control in them depends largely on sprays applied during the flowering period. However, new materials are now becoming available for brown rot control in the growing season. Thiram, if available to home orchardists, is recommended at ½oz. of the 95 per cent. material to 4 gallons of water.

Apples and pears: Black spot and codling moth are the main troubles affecting apples and pears. The lime sulphur plus colloidal sulphur mixture specified for stone fruit and applied at the same intervals is recommended for the control of black spot on apples. For black spot on pears Bordeaux mixture (1½oz. of bluestone plus 2½oz. of hydrated lime to 4 gallons of water) gives better control. Varieties of pears susceptible to russet (such as Winter Cole) should be given the same sprays as apples. Copper oxychloride materials such as "Cuprox", "Cuprokylt", and "Oxycop" may be substituted for Bordeaux mixture on pears and should be effective at ½oz. to 4 gallons of water. To any of the above materials (D.D.T. 50 per cent. wettable powder) at ½oz. to 4 gallons of water may be added for codling moth control. Lead arsenate at 1¼oz. plus hydrated lime at 3oz. to 4 gallons of water may be used instead of D.D.T., but not later than December owing to possible toxic residues remaining on the fruit. If D.D.T. is to be used throughout the season, D.D.D. (25 per cent.) at 1¼oz. to 4 gallons of water should replace the D.D.T. some time during November and again in January to control leaf-roller caterpillar as well as codling moth. Codling moth sprays should not be applied later than 3 weeks before harvesting.

[*Rendell's*

The upper lemons are affected with citrus verrucosis, a fungous disease causing irregular, wart-like lumps. The lower lemons are healthy.

Berry fruits: This month and again after the fruit has been picked spray with Bordeaux mixture (4oz. of bluestone and 5oz. of hydrated lime to 4 gallons of water). Lead arsenate at 1½oz. may be added. These applications should control fungous and insect troubles during summer. The next spray for strawberries should be the Bordeaux spray described applied post-harvest to control leaf spot. Maturing fruit should not be sprayed.

Grapes: When shoots are 4in. to 6in. long a spray mixture of 3oz. of copper oxychloride, 2oz. of colloidal sulphur paste, and 1oz. of 50 per cent. wettable D.D.T. powder to 4 gallons of water should be applied to control fungous diseases and insect pests during the growing season. This spray should be repeated just before flowering, when the fruit has set, and again when the berries are about half developed, after which further spraying is not usually necessary. Do not spray during the flowering period, as this may interfere with the setting of the berries. After fruit is half grown dusting with flowers of sulphur will control powdery mildew, which is then the main trouble. Dusts should be applied during still, hot weather for best results. Six dustings during the season should be sufficient if the dust is applied thoroughly to all foliage and fruit.

Citrus fruits: This month spray with Bordeaux mixture at the strength recommended for berry fruits to control fungous diseases such as citrus verrucosis. Add lead arsenate powder, 1oz. to 4 gallons of water, for the control of leaf-roller caterpillar. This application should be repeated in early January if necessary. To control scale insects on citrus trees spray with summer oil at 1 pint to 4 gallons of water in early February and again about a month later. Should aphis appear at any time from now on nicotine sulphate (5 teaspoons to 4 gallons of water) may be added to any of the above sprays. If used alone, nicotine sulphate should be activated by adding a little soft soap to the water to form a lather.

Fortunately there are few pests and diseases which are at present troublesome on sub-tropical fruits other than citrus.

Tree tomatoes: Powdery mildew is the most common tree tomato disease. It causes greyish white patches on the stalks and undersides of leaves. If the disease is unchecked, widespread infection may cause severe defoliation.

This disease can be readily controlled by spraying with lime sulphur at ¼ pint to 4 gallons of water. Applications should begin in spring at the first sign of infection and be repeated at 3-weekly to 4-weekly intervals until control is secured.

Virus infection is common in tree tomatoes, but usually does not seriously affect the cropping. There is no known control for virus diseases. If infection is severe, the trees should be destroyed.

Chinese gooseberries: The leaf-roller caterpillar is one of the few insect pests attacking the Chinese gooseberry and it can cause considerable damage to the fruit if spraying is neglected. The caterpillars can be controlled by spraying vines with arsenate of lead (1oz. to 4 gallons of water) or D.D.T. (1½oz. of 25 per cent. wettable powder to 4 gallons of water). Spraying should be started about the end of December and continued at 3-weekly intervals until February as necessary.

Passion fruit: Brown spot and grease spot are the two most common diseases which attack passion fruit. Brown spot (a fungous disease) is generally apparent in February and March; grease spot (a bacterial disease) is more noticeable in winter. Both diseases affect leaves, fruit, and laterals, and cause defoliation, shrivelling and dropping of fruits, and ultimately the death of the vine. Pruning in spring followed by thorough application of Bordeaux mixture 3 : 4 : 50 (4oz. of bluestone and 5½oz. of hydrated lime to 4 gallons of water) at monthly intervals throughout the year safeguards the vines and checks the spread of these diseases.

The importance of complete coverage of foliage and fruit cannot be overstressed. Always spray thoroughly and at the correct time. The above recommended intervals between sprays do not apply during wet weather. Sprays should be more frequent during unsettled weather, and trees should be resprayed soon after heavy rain, especially if the spray has not had time to dry.

Summer Pruning

Elimination of wood during the growing season is recommended only in special circumstances. Young trees and grafted trees should have unwanted growth removed at this time of the year to throw as much vigour as possible into the main framework. There are times when a fruit tree becomes over-vigorous and removal of foliage by summer pruning may help to reduce this excess vigour and encourage cropping. Where old stone fruit trees are being headed back to reinvigorate them this should be done during the summer, as infection of big cuts by silver leaf spores (*Stereum purpureum*) is less likely at this time. Half the tree should be cut back this summer and the other half next summer. Wounds should be protected by a bituminous paint.

A certain amount of foliage should be removed from grape vines during the development of the berries. Tips of growing shoots should be broken off after the fruit has set so that increased energy will go into fruit development. Summer pruning should never be too drastic, as it has a weakening effect on the vine. When the fruit begins to colour, any overhanging leaves should be removed to expose the bunches to sunlight and to promote ripening.

Autumn Management of Paspalum Pastures

UNDER good management paspalum (*Paspalum dilatatum*) will live in association with ryegrass and white clover and will produce a large bulk of feed during summer and autumn. Because of this paspalum is considered a valuable constituent of pastures in the warmer districts of the Auckland Province.

At the Northern Wairoa Demonstration Farm, Dargaville, production measurements have been taken for the past 5 years from a sward which is dominantly paspalum in summer and autumn and dominantly ryegrass in winter and spring, with much white clover and Yorkshire fog. The production of dry matter of pasture herbage from this pasture has been as follows:—

Year (1 June to 31 May)	Yield of dry matter of pasture herbage (lb. per acre)
1949-50	11,220
1950-51	13,330
1951-52	16,130
1952-53	19,030
1953-54	18,290

The yield in the 1952-53 season of 19,030lb. of dry matter is the highest yearly production secured to date in Extension Division trials. The trials are located on high-producing pastures throughout New Zealand. The figures show convincingly that a well-managed paspalum-ryegrass sward is capable of producing, on good land, herbage yields equal to or better than those of most other types of high-class swards in this country.

However, when it is permitted to get out of hand and grow tall and rank paspalum will smother out other grasses and the clovers, and a paspalum-dominant sward which is dormant for 6 months of the year results. Such a pasture suffers from a nitrogen deficiency because of the lack of clovers and soon becomes sodbound. Paspalum in the young leafy stage is comparable in feeding value to other summer grown pasture, but as paspalum reaches maturity the feeding value quickly falls off until it reaches the stalky stage, when it is little better than straw. By good management paspalum can be kept in the young leafy stage throughout summer and autumn. All grazing should be controlled by use of the electric fence and after each grazing pastures should be topped with the mower to remove seed heads and mature growth. In good seasons, when there is a surplus of feed in autumn, leafy paspalum can be converted into high-quality silage.

Sodbound paspalum pastures can be readily improved by correct top-dressing in conjunction with good pasture management methods. The introduction of ryegrass and white clover by oversowing after a severe harrowing or discing will sometimes be necessary to hasten results.

In good pastures the ryegrass is dominant during winter and spring and then paspalum takes over as the weather becomes warm in late spring, summer, and autumn. At no time does the paspalum hinder the growth of ryegrass provided that it is not allowed to become too rank in autumn.

—*C. M. BLICK,*
Fields Instructor,
Department of Agriculture,
Warkworth

Early Weaning of Lambs on Hill Country

INCREASED efficiency in the utilisation of pasture and great flexibility in stock management, especially in respect to shearing, pasture utilisation, and weed control, were two of the main advantages in early weaning of lambs on hill country that were indicated in work on this subject described by E. A. Clarke, Senior Research Officer, Department of Agriculture Animal Research Station, Ruakura, in an address to this year's Ruakura Farmers' Conference. The results of the research into early weaning, as discussed in the following adaptation of his paper, indicate what might be expected in similar early weaning of Romney lambs under average hill-country conditions.

PROBABLY the most usual time for weaning lambs in the North Island is in late December or early January, when the lambs are approaching 4 months of age. From time to time some farmers, for various reasons, have practised earlier weaning and reports on the merits of this practice have been uncertain and opinions often conflicting.

It is not uncommon to notice in a small flock where the animals are known individually or where ewes and lambs are suitably identified that lambs which become mismothered, especially later in the season, frequently grow well and suffer no apparent disadvantage.

Recent studies on milk production in ewes have also suggested that earlier weaning of lambs might warrant some investigation. In Fig. 1 are shown some average lactation curves of Romney ewes subjected to varying levels of feeding before and after lambing. The effect of level of feeding on the lactation curve is clearly shown. The curve produced by ewes with single lambs, under low-plane feeding both before and after lambing (L.L. singles), probably most nearly represents the situation obtaining with hill-country ewes. During the fourth month of lactation the lamb receives only about 10 per cent. of the milk produced in the entire lactation period. Lambs begin eating grass at 2 to 4 weeks and consumption rises rapidly, so that by about 2 months the lambs are becoming less dependent on milk and more dependent on grass.

Milk Factor

L. R. Wallace has shown, for example with individually fed ewes and lambs, that lambs in the seventh week of lactation eat as much food, other than milk, as in the whole previous 6 weeks. The declining importance of milk and the increasing importance of other feedstuffs in the diet of the lambs with advancing age is shown in Fig. 2. Under conditions

HEADING PHOTOGRAPH: The Ruakura Hill-country Research Station in the Raglan hills, where the trials described were carried out. The results of the trials indicate what might be expected in similar early weaning of Romney lambs under average hill-country conditions.

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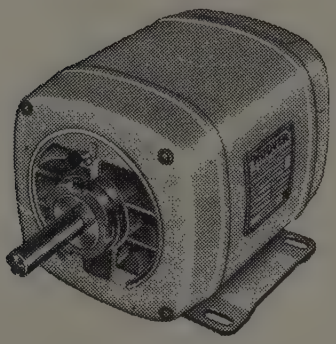

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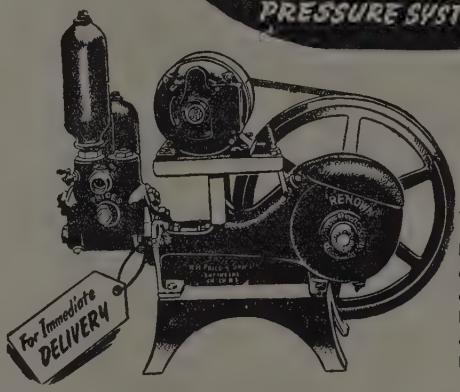

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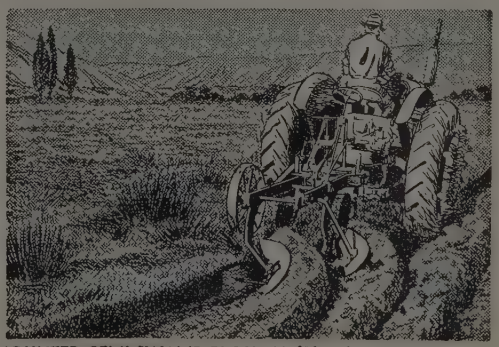

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of limited feed supply it is likely that toward the end of lactation the supplementary value of the milk received by the lamb may be offset by the increasing competition between ewe and lamb for available feed. This, it should be emphasised, is occurring at a time of the year when, even in a good season, increasing animal requirements are tending to outstrip pasture production.

Furthermore, because of the decline in the lactation curve, and to some small extent the changing composition of the milk, the gross efficiency of milk production declines as lactation advances. This decline is greatest in low-producing ewes and becomes most marked after the second month. L. R. Wallace has shown, for example, that in a low-producing ewe the gross digestible energy consumed to produce 1lb. of milk approximately doubles by the eighth to twelfth week.

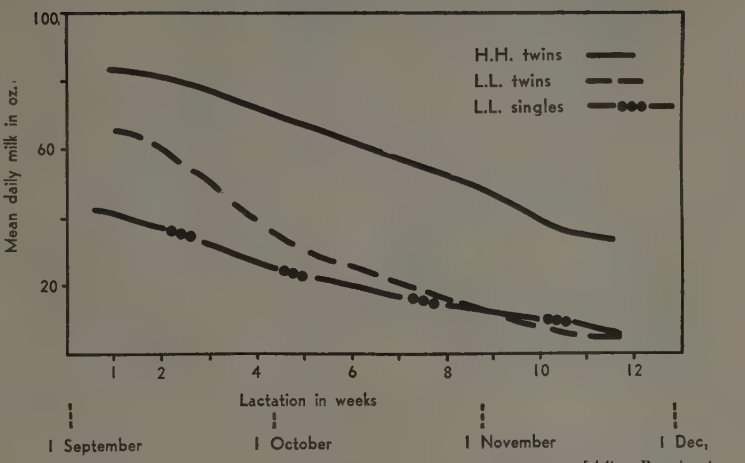
Conversion of Feed

A further loss of efficiency results from the double conversion of grass to milk by the ewes and milk to meat by the lamb. Approximate estimates only are available, but if it is assumed that the ewe is no more efficient than the dairy cow, the conversion of grass to milk is only 30 per cent. efficient. The lamb is probably also 30 per cent. efficient in the conversion of milk to body tissues, so that as the result of the double conversion efficiency falls to about 9 per cent. At the age of 3 to 4 months, however, the lamb is about three times more efficient than this (approximately 30 per cent.) in the direct conversion of grass to meat.

Such considerations as these and a limited experience in the early weaning of lambs suggested that early-weaned lambs might grow as well as, if not better than, lambs weaned at the normal time and at the same time enable greater flexibility in the utilisation of grass to be achieved as well as permit greater efficiency in stock management.

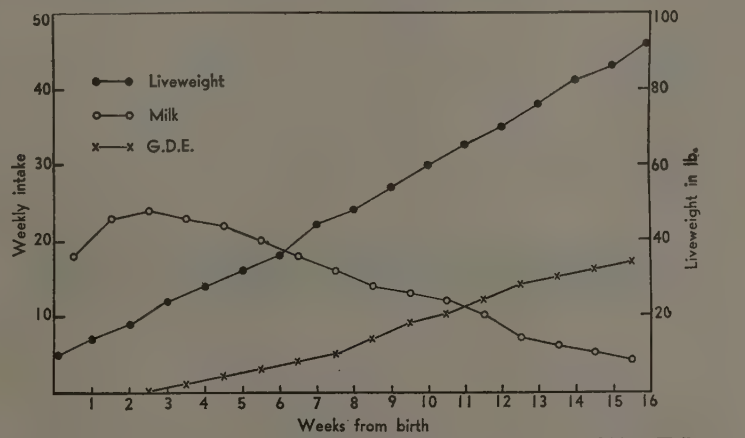
Early-weaning Trial

In 1952 a flock of 200 mixed-age ewes was run separately, so that an early-weaning trial could be carried out with ewe lambs. It was decided that the early-weaned group would be weaned at an average age of 12 weeks, and since lambing began in late August and extended over a period of about 9 weeks, the end of November was chosen as the time of early weaning. The late group were weaned on 7 January, 5 weeks later. At the time of early weaning the lambs averaged 49.5lb. liveweight and 83 days (12 weeks) in age, but ages ranged from about 50 days to 108 days. The early-weaned lambs were a random half of the ewe lambs of the flock and were weaned on to a paddock which had been lightly grazed by cattle and spelled from sheep for about a month. The dams of these lambs were removed from the flock and replaced by the same number of ewes with lambs at foot from another flock. Thus the total flock numbers were restored and the management of the flock continued along usual lines and at the same rate of stocking. The pasture provided was as good and as plentiful as that available to other ewes and lambs on the Station. The early-weaned lambs had ample feed of good quality until the time of late weaning, after which the early-weaned and late-weaned lambs were run together as one mob.



[*After Barnicoat*

Fig. 1—Average lactation curves of Romney ewes subjected to varying levels of feeding before and after lambing. (H.H. = high-plane feeding before and after lambing; L.L. = low-plane feeding before and after lambing.)



[*After Wallace*

Fig. 2—Declining importance of milk in diet of lambs at increased ages. (G.D.E. = gross digestible energy.)

The results of this trial are shown in Fig. 3, where it will be seen that the two groups, each of 40 lambs, are almost identical in their mean growth curves. Both groups grew reasonably well until 20 March, when they were again shifted to another paddock, where they rapidly lost weight. After the lambs were shifted again about a month later the growth-rate recovered and remained satisfactory thereafter. No explanation can yet be given for such paddock effects on growth-rate. It has been found in this and other trials that such paddock effects can be very marked, but so far these have been unpredictable.

The worm burdens of these lambs have been followed, the standard technique being used of counting the number of worm eggs in a known weight of dung from each lamb. The mean values in terms of eggs/gm. of dung are also shown in Fig. 3.

At the time of late weaning worm burdens were quite low in both groups. Drenching with phenothiazine was begun at this time and at no stage have the egg counts reached high levels. Throughout the trial no difference of any magnitude occurred between the two groups.

The amount of scouring was slight in both groups and there was no difference between groups in this respect.

There were two deaths in each group and though the causes could not be determined, it was clear that parasitism was not involved.

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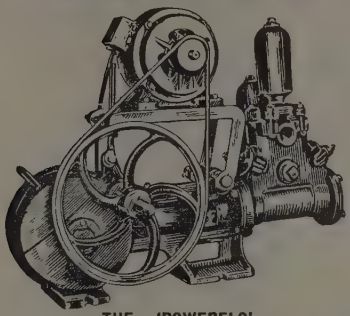

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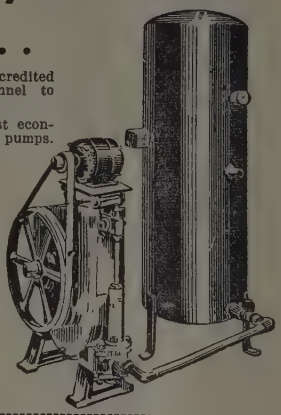

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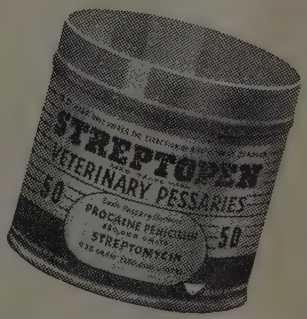

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weaned lambs grew as well as the late-weaned ones throughout and both groups were similar in wool clip, both as lambs and as hoggets. Lamb shearing was carried out in mid-December and was greatly simplified with early-weaned lambs, as the lambs were already separated from their dams and were brought in from the paddock when required, shorn, and immediately returned to their paddock. The late-weaned lambs had to be drafted from their dams and could not be mothered up again and returned to their paddock until both ewes and lambs had been shorn.

The early-weaned ewes, with other dry ewes, were used to clean up a paddock where the feed was rough and unsuitable for ewes and lambs and where ragwort threatened to be a problem. Thus early weaning, in addition to sparing pastures suitable for lambs, enabled ewes to be employed some 5 weeks earlier for pasture improvement.

A further advantage of early weaning is that where bidi-bidi is troublesome in some paddocks weaning in late November before the seed ripens may enable the lambs to be concentrated on the cleaner paddocks. The "seedy" paddocks can be grazed by shorn ewes and the lambs need not be shorn until desired.

Various methods of early weaning could be devised, but it should be pointed out that where the provision of spelled pastures is difficult good results might be expected by merely removing the ewes and leaving the lambs in their paddocks. As necessary the lambs could be suitably consolidated and either set stocked or rotationally grazed to allow sufficient paddocks for the ewes. Earlier mob grazing of ewes has obvious advantages in pasture control and improvement. It is hoped to carry out suitable trials of such methods in the near future.

In the 1953 season, when this early-weaning trial was repeated, feed conditions were less favourable than in the previous year, though a suitable spelled paddock with ample feed was available for the early-weaned lambs. This pasture became somewhat stemmy in the last week of December, which probably contributed to the spread of a mild outbreak of pink eye in these lambs. It is believed that these conditions were responsible for the less favourable result (shown in Fig. 4) in the early-weaned group. Over the period 29 November to 5 January the late-weaned lambs also grew slowly, but achieved an advantage of about 3lb. over the early-weaned ones. This result is less satisfactory than in the previous season, where both groups gained about 5lb. to 6lb. over the same period.

After late weaning both groups were run together in a fresh pasture and grew well and at identical rates for the next month. This improved rate of growth in both groups suggests that both the early- and late-weaned lambs were inadequately fed during the previous month. The similarity in the growth curves in both groups was maintained for a considerable time, but at no time did the difference between groups exceed 3lb. From 13 February both groups showed the typical picture of hogget ill-thrift.

Throughout the trial parasitism was kept at a very low level with regular drenching with phenothiazine and at

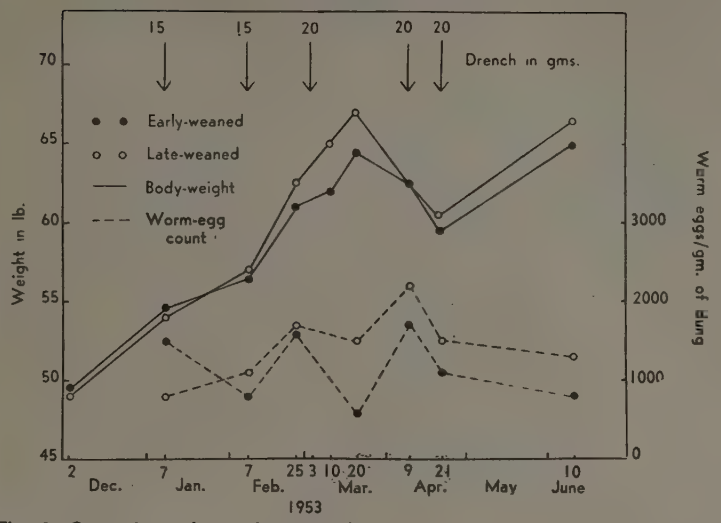

Fig. 3—Comparison of growth-rates and worm-egg counts, with drenching rates, in early-weaned and late-weaned lambs.

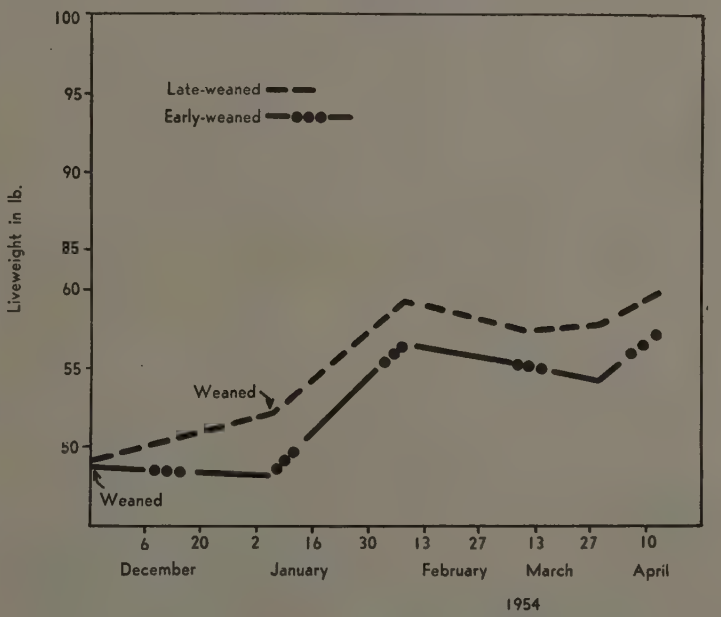

Fig. 4—Growth-rates of early-weaned and late-weaned lambs in second trial.

no time was there any marked difference in the mean egg counts of the two groups (Fig. 5).

In this season a random half of the male lambs from this flock were also weaned early. The result with these lambs was similar to that for the ewe lambs at the time of late weaning, when the male lambs were withdrawn from the trial.

This year also an early-weaning trial was carried out with another small flock. In this trial a random half of lambs of both sexes were weaned on to a well-spelled, leafy pasture and the dams of these were also withdrawn from the flock but not replaced with ewes with lambs at foot. In this trial the 45 early-weaned lambs, irrespective of sex, averaged about 5lb. heavier than the 45 late-weaned lambs at the time of late weaning. The result of this trial for the two groups of 20 ewe lambs each is shown in Fig. 6.

The results of these trials have been presented in terms of group means. The records of individual animals, however, showed no serious anomalies, and in general the younger and lighter animals grew and behaved relatively

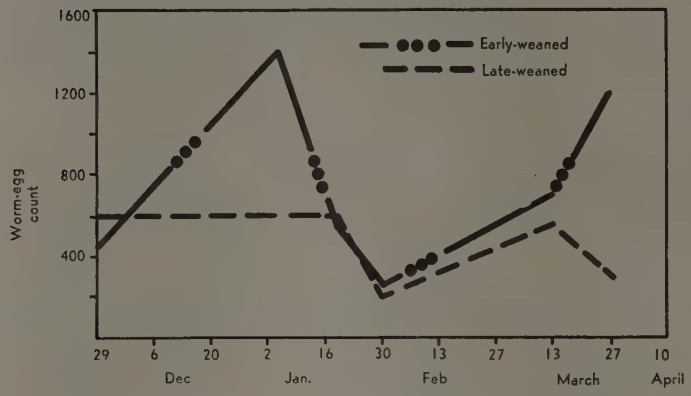

Fig. 5—Worm-egg counts of early-weaned and late-weaned lambs.

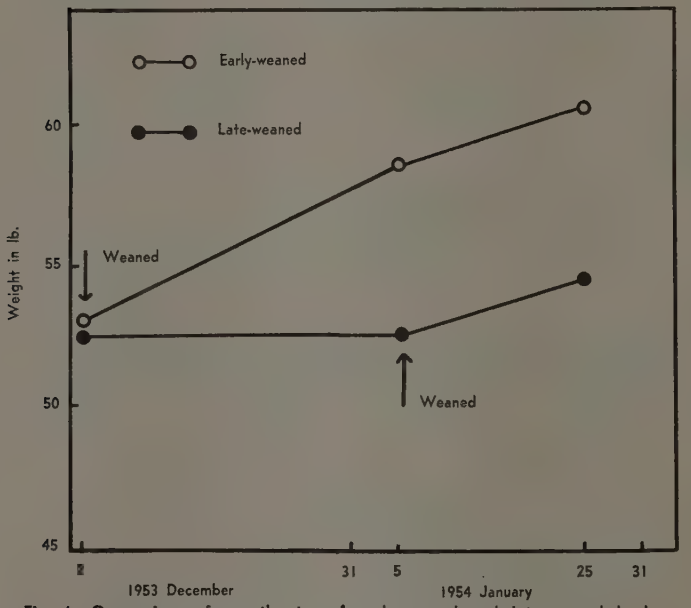

Fig. 6—Comparison of growth-rates of early-weaned and late-weaned lambs.

the same as the older and heavier animals.

Though the results of the trials presented are not perfectly consistent, it can be said that differences in the growth pattern between late- and early-weaned lambs are either nil or small. It is most probable that the small differences seen are entirely due to feed conditions. When early- and late-weaned lambs were grazed separately every effort was made to provide each with the best feed available. With this in mind, it is believed that these results indicate the sort of result to be expected in similar early weaning of Romney lambs under average hill-country conditions.

Advantages of Early Weaning

The main points arising from this study may be summarised as follows:—

1. Early weaning of lambs may be expected to result in increased efficiency in the utilisation of pasture.
2. In two seasons lambs weaned in early December were, on the average, very similar in liveweight and rate of growth to lambs weaned in early January or 5 weeks later.
3. The slight inferiority in one group of early-weaned lambs in one season was most likely due to unsuitable feed rather than a deficiency in quantity of feed.
4. Differences between early- and late-weaned lambs at the time of late weaning tend to persist for some months thereafter, irrespective of rate of growth.
5. Early weaning confers great flexibility in stock management, especially in respect to shearing, pasture utilisation, and weed control.

Preventing Damage by Potato Tuber Moth

IN dry seasons in the North Island and especially in Hawkes Bay severe damage is caused to main crop potatoes by the caterpillar of the potato tuber moth. Crops growing in the lighter soils and those which dry out rapidly are attacked with much greater severity than crops on the heavier soils, which retain moisture. If no precautionary measures are taken, the whole crop can become affected and its commercial value reduced. It is not uncommon for a crop to be a complete loss.

The caterpillar does not thrive under damp conditions, so that in a wet season damage to crops is practically negligible.

The potato tuber moth is a small, brownish-grey moth about ½in. long. In a growing crop the female lays its eggs in the eyes of any exposed tubers or at the bases of the stems. The larvae then burrow into the tubers, making them useless for commercial purposes and for seed.

The first precaution to be taken is to plant the tubers at least 7in. to 8in. deep. Rows should be not less than 30in. apart so that periodical moulding can be done throughout the growing season. The wider the rows are the better it is, as more soil is available for complete coverage of the tubers. This coverage is essential, because once the tubers are exposed they are open to direct attack by the moths. Widely spaced rows also allow for only a minimum amount of damage to the foliage when moulding is done.

The first ridging should be delayed until the foliage is well grown, though cultivation between rows is necessary to keep weed growth down. The reason for delaying the first ridging is to retain the moisture content as long as possible.

The moth is generally on the wing in mid-January, but in a very dry spring it may be noticed somewhat earlier. Spraying with lindane has been found to be most effective in controlling moth attacks. The first spraying must be undertaken as soon as the moth makes its appearance. To keep the crop free of moth damage spraying every 2 weeks is necessary. Moulding must also be done at intervals during the spraying period. In the event of rain applications of spray must begin again after the topsoil dries out.

After digging, the bags should be sewn up immediately and at no time should the foliage or haulms be placed over the mouths of the bags.

Pitted potatoes should be well covered with straw before they are sprayed. Finally, it is essential that the lindane should not come into contact with the potato tubers; otherwise a taint will be noticed after they are cooked.

—*F. H. COLLIN,*
Fields Instructor,
Department of Agriculture,
Hastings

Low Voltage Electrical Soil Warming

ONE of the important factors governing plant growth is soil temperature. In this article by A. A. Powell, Storage Specialist, and M. G. Baumgart, Assistant Storage Specialist, both of the Department of Agriculture, Wellington, the use of low voltage electric power to raise and maintain soil temperature in propagating benches and glasshouses is discussed and a number of suggested layouts are described. This article has been prepared in conjunction with the Electrical Supply Authorities Association, which has recently issued a technical engineering publication on the subject.

ON the evidence of experiments and commercial installations in New Zealand low voltage electrical soil warming is a safe, reliable, and economical method of maintaining optimum soil temperatures in propagating benches for seed sowing or the rooting of cuttings and for the initial raising and maintaining of suitable soil temperatures in glasshouses. In propagating benches where bottom heat is required it has been the usual practice to place hot-water pipes in sand below the bench. This is a stisfactory and economical method where a boiler is already in use for other purposes, but would be expensive both to install and to run if the boiler were required for this purpose only.

In glasshouses, tomatoes require a minimum soil temperature of 57 degrees to 60 degrees F. at a depth of from 6in. to 9in. to make satisfactory growth. In New Zealand early tomato crops are transplanted in June, July, and August, when the soil temperatures in unheated houses vary from approximately 50 degrees to 55 degrees F. To raise this soil temperature to a satisfactory level houses which are fitted with hot-water-circulating heating systems need to be heated for 2 to 3 weeks before planting. This is a very expensive method of heating the soil, as heat passes very slowly down through the soil and at the same time heat loss through the glass is very high.

With low voltage electrical soil warming the total heat input is applied to the soil and very little heat loss to the air occurs. The soil can be raised to the required temperature within 36 hours and maintained at that temperature until artificial heating is no longer required. Some heat seems to be necessary in southern districts until about the end of September.

Where space heating alone is used a minimum air temperature of about 55 degrees F. must be maintained to keep the soil temperature at a reasonable level. With soil warming, however, air temperatures could be safely allowed to reach a minimum of approximately 45 degrees F. According to overseas literature this temperature in the early stages of plant growth assists in the formation of large flower trusses.

Equipment

The equipment required for low voltage electrical soil warming consists of a transformer of sufficient capacity, heavy stranded copper secondary (low voltage) mains, connecters for joining the secondary mains to the heating circuits, and galvanised steel heating wires. Control may be by hand switching or by a soil thermostat.

Before purchase or installation of any of this equipment it is necessary to consult the local power authorities to ensure that power will be available and to determine the most economical period of heating. Some power authorities will supply power at a cheap rate for 10-hour night switching, and this may be used satisfactorily for soil warming.

The local supply engineer may also advise on transformer types and the size of secondary mains and line connecters. Before any wiring in excess of 20 volts is installed a permit must be obtained from the supply authority.

Transformers: These should conform with specifications laid down by the Electric Supply Authority Engineers' Institute.

Soil thermostats: These should have a range of approximately 45 degrees to 85 degrees F. and the element should be protected from moisture and dirt by a stainless steel sleeve (see Fig. 1).

Copper mains and line connecters: The size and number of these will depend on the capacity of the transformers, the method of wiring, and the length of secondary mains required.

Galvanised steel heating wire: The gauge and length of the circuits will depend on the plan of wiring, the voltage available from the transformer, and the required amount of heat to be applied.

TOMATO GLASSHOUSES

It has been found that by use of a transformer to supply bare galvanised steel wire grids a pressure of not more than 20 to 30 volts is required; 30 volts is necessary only for large glasshouses (150 to 200ft. long) when they are planted with the rows running the length of the house and a single transformer is used to supply the whole house.

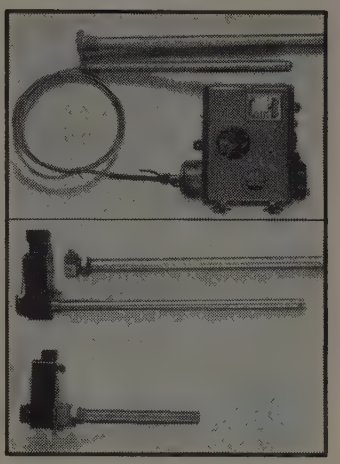

Fig. 1—Soil thermostats with protective sleeves.

When continuous power supply is used an electric loading of approximately 2 watts per foot run of wire will suffice.

For 10-hour power supply on night switching the electrical loading should be from 4 to 6 watts per foot run of wire.

The initial cost of installation is considerably cheaper for continuous power supply, but the reduced rate which is generally available for off-peak loading should repay the initial higher cost of the type of transformer needed for non-continuous supply.

Voltage Reduction Tappings

To provide flexibility of operation under varying weather conditions several different voltage reduction tappings are provided on the transformer.

When the warming wire circuits are laid the legs of the circuits are placed directly below the rows of plants at a depth of from 9in. to 12in. Several methods are used for planting tomatoes in glasshouses. Some houses are

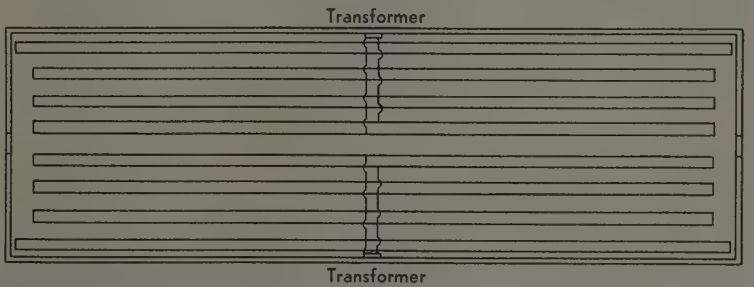

Fig. 2—Plan of soil warming wire circuits for lengthwise planting of glasshouse and suitable for continuous or 10-hour power supply.

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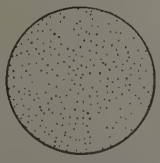

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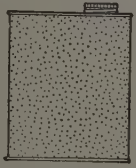

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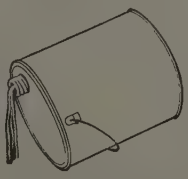

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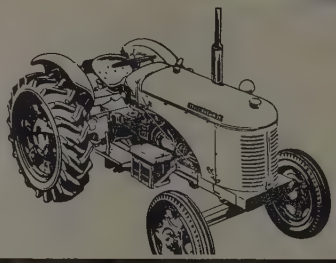

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planted with rows running the length of the house (see Fig. 2) and others with rows across the house and with a central path down the length of the house (see Fig. 3). The method of planting determines the method of laying the legs of the warming wire circuits.

Lengthwise Planting (Fig. 2)

To warm the soil of a glasshouse with inside dimensions 100ft. x 30ft. when the tomatoes are to be planted with rows running lengthwise, warming wires are spaced alternately 1ft. 6in. and 2ft. 6in. apart and the plant rows are immediately above the wires (Fig. 2).

Transformers (Fig. 2)

The transformers which will have to be installed for the circuits shown in Fig. 2 will vary according to whether continuous power supply or 10-hour supply (night switching) is used.

Continuous supply: Two 2000 VA (watts) transformers are required, one on each side of the house in a central position where power plugs are located. The voltage reduction tappings on these transformers are 15 and 12 volts.

10-hour supply or dosage method: Two 4000 VA transformers with voltage reduction tappings of 20, 17½, and 15 volts will be necessary.

Warming Wire Circuits (Fig. 2)

There is a total of 16 wire circuits, each circuit consisting of 99ft. 6in. of No. 10 s.w.g. (British standard wire gauge) galvanised steel wire for a 100ft. x 30ft. glasshouse planted lengthwise.

Crosswise Planting (Fig. 3)

The crosswise planting method in a glasshouse 100ft. x 30ft. is shown in Fig. 3. The warming wires are laid in the soil to a depth of 9in. to 12in. directly below the plant rows. The spacings between the legs of the circuits can be the same as for lengthwise planting (1ft. 6in. and 2ft. 6in.). An extra plant can be placed above each of the bends of the wire circuits at the sides of the house.

Transformers (Fig. 3)

The transformers required for houses to be planted crosswise are:—

Continuous supply: Two 2000 VA transformers with voltage reduction tappings of 15 volts and 12½ volts are needed. The transformers can be strapped to the bottom plate.

10-hour supply: Two 4000 VA transformers are required. Voltage reduction tappings are 20, 17½, and 15 volts.

Warming Wire Circuits (Fig. 3)

There are a total of 16 circuits with 90ft. 6in. of No. 10 s.w.g. galvanised steel wire in each (6 legs each 13ft. 6in. long, the bends bringing the total wire in each circuit to 90ft. 6in.).

Secondary Leads and Line Connecters

The secondary leads are of copper and they and the connecters should be specified according to the load requirements. It is extremely important that the leads should be of sufficient size to avoid excessive voltage drop. On this point the advice of the engineer of the local electric supply authority should be sought.

Soil temperatures may be controlled either by manual switching or by a thermostat. When 10-hour night supply is used switching is usually done by a time switch, which may be obtained from the local electric supply authority.

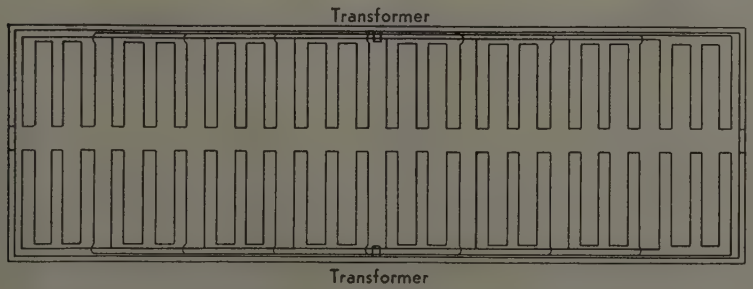
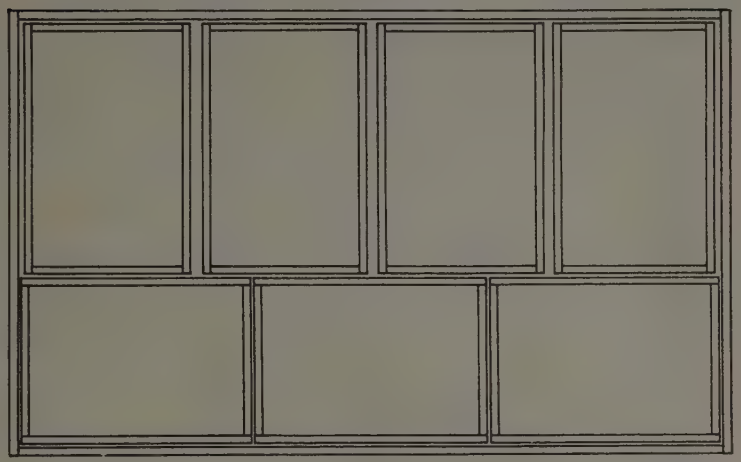


Fig. 3—Plan of soil warming wire circuits for crosswise planting and suitable for continuous or 10-hour power supply.



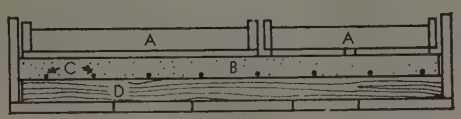


Fig. 4 (above)—Propagation bench with internal dimensions of 5ft. x 3ft., showing positions of 7 standard seed boxes each having outside dimensions of 20in. x 14in. x 2½in.

Fig. 5 (left)—Cross-section of bench. A—Seed boxes. B—2in. of sand. C—Warming wires 4½in. apart (outside wires 2½in. from sides of bench). D—2in. x 2in. batten.

Soil Thermostat

The soil thermostat should be placed in the soil as near to the transformer as is practicable. When a thermostat is installed it must be connected by a registered electrician, as it is connected to the high voltage side of a transformer.

A soil thermostat is a sensitive instrument and must be fitted with a protective sleeve as a safeguard against moisture and mechanical injury. It should be placed in the soil at a depth of approximately 6in. and 3in. to 4in. above and across the warming wires.

Check on Soil Temperatures

As a check on soil temperatures it is advisable to place a tested mercury-in-glass thermometer in the soil with the bulb at a depth of about 6in. A tested capillary-tube thermometer with calibrated dial may be used for convenience. The bulb should be about 6in. in the soil and placed horizontally in a position covered by the plant roots.

PROPAGATING BENCHES

The dimensions of propagating benches given in this article are multiples of 5ft. x 3ft., which will take 7 standard (20in. x 14in. x 2½in.) seed boxes. The method of arranging seed boxes is shown in Figs. 4 and 5.

Benches should be constructed so that they may be used for propagating in seed boxes, pots, or directly in the bench filled with a propagating medium.

The warming wires are supported and stapled on 2in. x 2in. battens

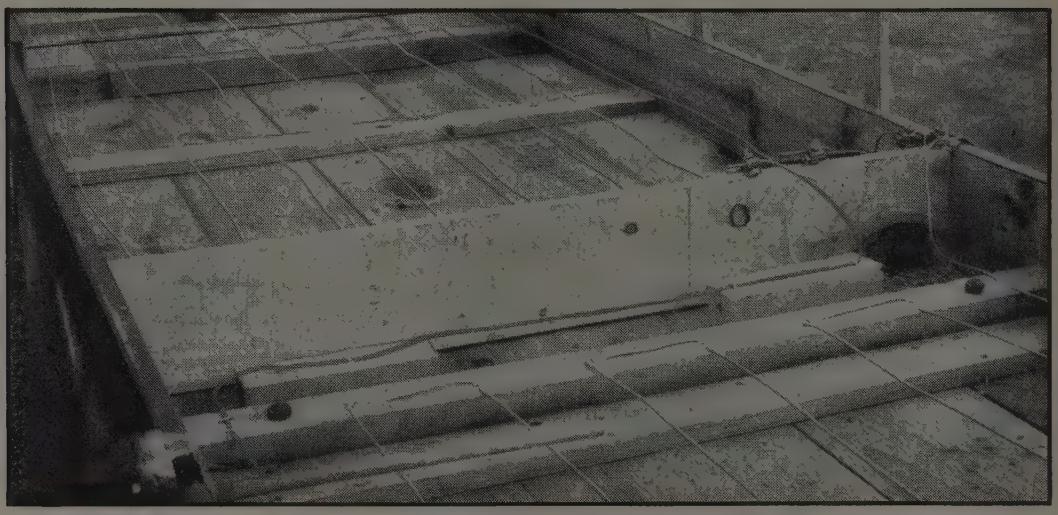


Fig. 6—Method of laying warming wires in propagating bench.

spaced 2ft. 6in. apart across the width of the bench (see Fig. 6). The floor of the bench is then covered with coarse river sand to a depth of 4in. so that there is 2in. of sand below the wires and 2in. above. The sand should be kept damp so that the heat is readily transferred and an even temperature is maintained over the area of the bench. The seed boxes should be packed on top of the sand as closely as possible to avoid heat losses between the boxes.

When pots are used they should be placed close together and the spaces between pots filled with coarse sand.

If plants are to be propagated directly in the bench, 3in. to 4in. of propagating medium should be placed on top of the sand.

High Voltage Soil Warming Cable

For use in comparatively small frames a 230 volt soil warming cable is being manufactured. Use of this cable will reduce the cost of installation, as a transformer is not needed. Though the method is reasonably successful and safe with some types of cable, this type of soil warming can neither be as flexible nor as safe as the low voltage method. The operating costs for both methods will be the same.

Soil Temperatures

The soil temperatures required for successful propagation of various plants range from 57 degrees to 75 degrees F. The most reliable method of controlling soil temperatures in propagating benches is by a soil thermostat (Fig. 1). The range of the thermostat should be 45 to 85 degrees F. with a temperature differential of 3 to 4 degrees.

Equipment required for soil warming of benches 20ft. x 3ft., 15ft. x 3ft., and 10ft. x 3ft. with two circuits and 5ft. x 3ft. with one circuit is shown in the table below. The layout of the circuits is shown in Figs. 7 and 8.

The electrical loadings shown for the warming wire circuits may be reduced by changing to lower voltage reduction tappings on the transformers.

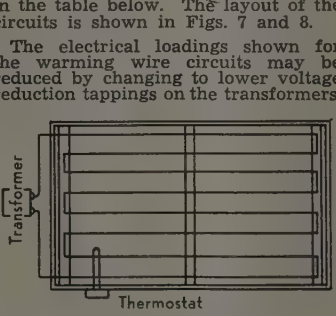


Fig. 8—Plan of warming wire circuit for propagating bench 5ft. x 3ft.

EQUIPMENT FOR SOIL WARMING OF PROPAGATION BENCHES

	20ft. x 3ft. (60 sq. ft.)	15ft. x 3ft. (45 sq. ft.)	10ft. x 3ft. (30 sq. ft.)	5ft. x 3ft. (15 sq. ft.)
Wire gauge (s.w.g.) ..	No. 10	No. 10	No. 14	No. 14
Length of wire in each circuit and total ..	152ft. (2 circuits of 8 legs with 76ft. per circuit)	120ft. (2 circuits of 8 legs with 60ft. per circuit)	80ft. (2 circuits of 8 legs with 40ft. per circuit)	40ft. (1 circuit of 8 legs with 40ft. per circuit)
Size of transformer ..	750 VA (watts)	500 VA (watts)	300 VA (watts)	200 VA (watts)
Voltage reductions ..	14, 12, 10 volts	10, 8, 6 volts	10, 8, 6 volts	10, 8, 6 volts
Electrical loading:	At 14 volts	At 10 volts	At 10 volts	At 10 volts
Per sq. ft. of soil ..	10 watts	8.8 watts	9.0 watts	9.0 watts
Per ft. of wire ..	4 watts	3.3 watts	3.4 watts	3.4 watts

All the electrical loadings shown in the table for propagation benches are for thermostatic control.

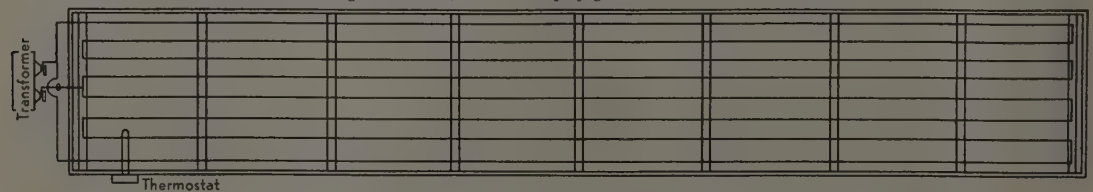


Fig. 7—Plan of two warming wire circuits for propagating benches 20ft. x 3ft., 15ft. x 3ft., or 10ft. x 3ft.

A New, Improved Strain of Cocksfoot

By L. CORKILL, Chief Plant Breeder, Grasslands Division, Department of Scientific and Industrial Research, Palmerston North

IN New Zealand cocksfoot has always been considered one of the most valuable pasture species. Not so many years ago no farmer would think of sowing down a permanent pasture without the inclusion of cocksfoot. That great authority on New Zealand grasslands A. H. Cockayne, writing in 1914 on seed mixtures for bush burns stated: "It is the most valuable pasture grass in New Zealand, being adapted to a wide range of soil and climatic conditions". In recent years its pre-eminent position has been taken over by perennial ryegrass. The rise of ryegrass to favour has resulted from work on selection, breeding, and certification leading to the almost complete elimination of the short-lived "false" perennial strains, which at one time dominated the ryegrass seed market in this country.

Comparative production of cocksfoot strains at Palmerston North. Three rows on the left are Akaroa, the three centre rows are Grasslands, and three rows on the right are C.23 strain.

NEW ZEALAND cocksfoot has had a good reputation not only in this country but overseas, and in the past considerable quantities of seed have been exported. In England both Gilchrist and Stapledon showed that New Zealand cocksfoot was superior to various Continental and American strains in leafiness, tillering capacity, and persistency.

As long ago as 1914 work was begun by W. S. Hill at the Moumahaki Experimental Farm on breeding an improved cocksfoot. He found wide diversity in plant characters both between and within lines of seed of different origins. His objective was to produce a cocksfoot with increased bulk and quality of herbage and with a high degree of resistance to rust. In 1919 Cockayne reported that cocksfoot strains selected at Moumahaki gave high seed yields under the Danish system of seed production in interculti-vated rows. There is no record of any of these selections being grown to any extent in New Zealand, and without a system of seed certification to ensure a supply of pure seed any new strain would have been rapidly lost by contamination with other strains already being grown for seed.

Studies in New Zealand by Levy and Davies in 1929 showed that New Zealand lines were superior to imported European and American strains. Lines from Akaroa, the plains of Canterbury, Wairarapa, Hawkes Bay, and Southland differed little among themselves, though within each line there was a mixture of types.

After Levy's and Davies's work and the inauguration by J. W. Hadfield of the Government seed certification scheme seed from known areas was first certified as true to type in 1932. In the meantime Hilgendorf and J. W. Calder at Canterbury Agricultural College had produced a strain of cocksfoot, C.23, which in 1938 was distributed as Certified Pedigree seed. It was described by Calder as an improved pasture type, forming a finer and denser sward than the Akaroa strain. Since then this strain has been the basis of the higher classes of Certified cocksfoot seed.

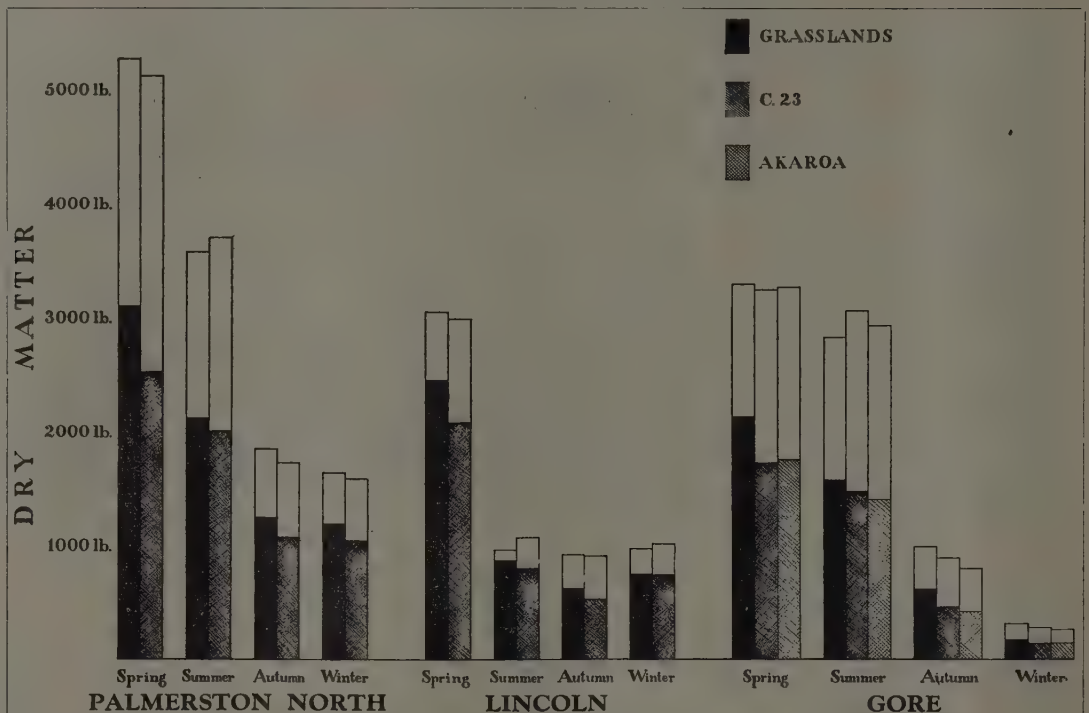
Some years ago work was begun at the Grasslands Division, Department of Scientific and Industrial Research, Palmerston North, on breeding an improved strain of cocksfoot. The aim of this work was to produce a type of cocksfoot more vigorous and bulky than either the Akaroa or C.23 strains, with greater seedling vigour, better seasonal spread of production, and greater ability to recover rapidly after grazing. A strain has now been produced which has been tested at Palmerston North, at the Lincoln and Gore sub-stations of the Division, and on various farms. It has proved sufficiently superior to the present Certified strains to warrant its increase under certification and release to farmers.

Characteristics of the Grasslands Strain

Under pasture conditions this cocksfoot is not obviously different in appearance from either the C.23 or the Akaroa strain. It is wider in the leaf than C.23 and a slightly lighter green than either of these strains. These features are, however, not sufficiently distinct to enable differentiation in the field. Numerous trials have shown that it grows more rapidly in the seedling stage than either of the other two strains. Cocksfoot is a species which does not establish rapidly and even with its improved seedling vigour the new strain must still be considered relatively slow to establish.

The most valuable feature of this cocksfoot is its improved vigour and leaf production. In the graph on the next page its production relative to that of the C.23 strain is shown. The graph is based on the seasonal production measured as dry weight in pounds per acre. The data from Palmerston North and Lincoln are averages for 3 years and those from Gore for 4 years. For the latter trial a further comparison with the Akaroa strain is shown. The trials, which at Palmerston North and Lincoln were sown in small paddocks and at Gore in replicated plots, were periodically grazed with sheep. The seeds mixture consisted of cocksfoot, Italian ryegrass, and white clover, but at Lincoln Montgomery red clover was also included. The total height of each column represents the total dry weight in pounds per acre for each season. The shaded portion represents the dry weight of the cocksfoot in the sward and the unshaded portion the dry weight production from the clover and other species, which included Italian ryegrass and unsown species.

At each location there is very little difference in the total annual or seasonal production per acre regardless of which cocksfoot strain is used. When, however, the contribution that the cocksfoot makes to that production is considered it is seen that at all locations and in all seasons the new strain is superior to the others. At Palmerston North, Lincoln, and Gore the percentage increase in average annual production is 15, 13, and 20 respectively. The superiority is evident more particularly in the spring growth, where the increase is 23, 18, and 23 per cent. One of the most striking features of this cocksfoot not only in these trials but in observational trials in different districts throughout New Zealand has



A comparison of the seasonal production of Grasslands and C.23 cocksfoot in two trials averaged over 3 years and that of Grasslands, C.23, and Akaroa cocksfoot in a third trial averaged over 4 years. The seasonal production is measured as dry weight in pounds per acre. The total height of each column represents the total dry weight of sward, the shaded portion in each the dry weight of cocksfoot in the sward, and the unshaded portion the dry weight production from the clover and other pasture constituents.

been its relatively early spring growth compared with that of C.23.

The effect of locality on the seasonal production of cocksfoot is shown clearly in the graph. In the low winter temperatures at Gore the winter growth of cocksfoot is only 4 per cent. of its annual production, and in the milder winter at Palmerston North it is 16 per cent. Then again, in the relatively dry summers at Lincoln the summer growth of cocksfoot is only 19 per cent. of its annual production, and in Palmerston North's wetter summer it is 28 per cent.

Seed Production

One of the criticisms of C.23 cocksfoot has been that its seed production is lower than that of the old Akaroa strain. In pasture plants seed production is secondary to leaf production, but if ample seed supplies of a new strain are to be made available at an economic price, the strain must be a reasonably good seed producer.

Trials have been carried out at Palmerston North, Lincoln, and Gore to determine seed yields of the Grasslands, C.23, and Akaroa strains during the 4 years 1949 to 1952. The cocksfoot was sown pure in drills 24in. apart in replicated plots and harvested in each of the 4 years. Purity and germination tests were obtained of the machine-dressed seed. In the following table the average yield of each strain at each location in pounds of pure germinating seed per acre is shown.

AVERAGE YIELD IN LB. OF PURE GERMINATING SEED PER ACRE OF THREE COCKSFOOT STRAINS FOR PERIOD 1949-52

Strain	Palmerston North	Lincoln	Gore
Akaroa ..	358	358	394
C.23	351	308	348
Grasslands ..	363	336	361

At Palmerston North there were no significant differences in seed yield between the three strains. At both Lincoln and Gore the Akaroa strain was significantly higher in yield than the other two. The yield of the Grasslands strain was significantly greater than that of C.23.

Under the diverse conditions of these trials the new strain has proved to have a satisfactory seed yield, but farmers growing it for seed would be well advised to consider the use of nitrogenous fertilisers to increase seed yields. It begins growth earlier in spring than either the C.23 or the Akaroa strain and consequently is likely to make greater demands on the available soil nitrogen early in the season, with a consequent reduction in seed yields.

Seed Supplies

Seed of the Grasslands strain is now being increased under the Government seed certification scheme. J. H. Claridge, Superintendent of the Seed Industry, Department of Agriculture, states that in the spring of 1953, 3100lb. of Certified Government Stock seed were distributed for increase growing, and further distributions will be made each year in future. No more releases of the C.23 strain will be made under the description Certified Government Stock seed. As the supplies of the new cocksfoot are increased seed will be certified also in the lower certification classes; thus the strains which are at present recognised under certification will gradually be replaced.

Bulletin on Growing of Glasshouse Tomatoes

Tomatoes are easily the most important vegetable crop grown in glasshouses in New Zealand. About 2,000,000 plants, with an average yield of 4½lb. per plant, are grown annually. The special practices which are necessary with tomatoes under glass are described very fully in a new Department of Agriculture Bulletin No. 370 "Growing Tomatoes in Glasshouses", which is available free from the nearest office of the Department of Agriculture.

Hive Management in Preparation for Honey Flow

Seasonal Notes for the Domestic Beekeeper

LATE spring and early summer are the main flowering periods of many of New Zealand's nectar producing plants and trees. Numbers of these trees and plants, though yielding nectar copiously, do so only for a matter of days or at best a few weeks, and it is in these limited periods of plenty that the bees must gather that surplus honey to the securing of which their whole existence has been directed. In this article D. Roberts, Apiary Instructor, Department of Agriculture, Auckland, deals with some of the preparations and equipment necessary for bees to get the best possible crop.

SECURING of the greatest honey crop possible in the circumstances is the culmination of the beekeeper's endeavours. Though the bees may have been carefully brought to the highest possible standard of health and strength in preparation for the main honey flow, much honey may still be lost if they are not provided with combs or foundation for storage room at the appropriate time. Management methods during the flow will vary according to which of the three types of honey (extracted honey, comb honey in bulk, or section comb honey) it is desired to produce.

Equipment

Though the production of honey for extraction generally calls for less intensive management during the flow than is necessary for successful comb honey production, it is difficult to secure a first-class product without the use of a honey extractor, strainers, and other equipment. Such material may cost a few pounds, but to the beekeeper desiring a first-class product it is an essential and worthwhile investment.

Because of the cost involved in purchasing this equipment, many beginners turn to the production of bulk comb honey or section comb honey. The outlay here for material other than that required for the establishment of the hive is comparatively little. However, the successful production of comb honey, particularly section comb honey, calls for most intensive hive management and a very sound knowledge of bee behaviour, local nectar sources, and weather.

Most beginners, and those beekeepers who are situated in areas where the honey flow is light and drawn out or subject to continual interruption by unfavourable weather, will find production of extracted honey the most rewarding method both in ease of maintenance and the ultimate crop.

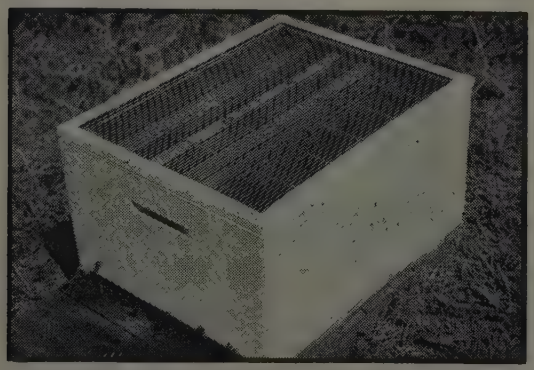
[*Rendell's*

Adding a super of extracting combs. The queen excluder is above the brood chamber.

Extracted Honey

If spring management has been successful, colonies will be strong, will not have swarmed, and will be headed by queens able to maintain colony strength throughout the strenuous days ahead. If colonies are in this condition, there is little more that can be done toward improving them; they are ready for the honey flow.

It is of paramount importance that the bees be provided with room for storage of nectar as soon as the flow begins. It is best if drawn combs are given in the first super to be added so that immediate room is provided for storage of nectar and the congregation of the bees. This super should be added immediately the combs along the tops of the frames already in the hive show evidence of white, freshly secreted beeswax. Any delay at this stage in providing the super will cause congestion with the risk of consequent swarming.



A queen excluder in position over a single chamber brood nest.

Beginners or those without an extractor may lack drawn combs for this purpose. A super of frames fitted with full sheets of comb foundation should then be given. It will help to encourage the bees to work on the foundation if combs of honey from the super underneath are lifted up and placed next to the outside wall of the new super. These combs are replaced in the lower super with frames of foundation. When frames of foundation are being placed in the lower supers care should be taken not to place them between frames of brood. They should always be placed outside the brood nest.

If the flow is only light or is interrupted by weather when drawn combs are given, the queen may enter the honey super and use the combs for brood rearing. This can be prevented by the use of a queen excluder, a device made of wire or sheet metal which prevents the passage of the queen or drones but gives free access to workers. Queen excluders are a valuable asset and their use greatly simplifies many manipulations in beekeeping.

When the bees have occupied the top super and are storing nectar and honey freely in most of the combs it is time to give another super. Though room for honey storage should be given in advance, over-supering should be avoided. When supers of drawn combs are added they should be placed on top of the other supers and this "top

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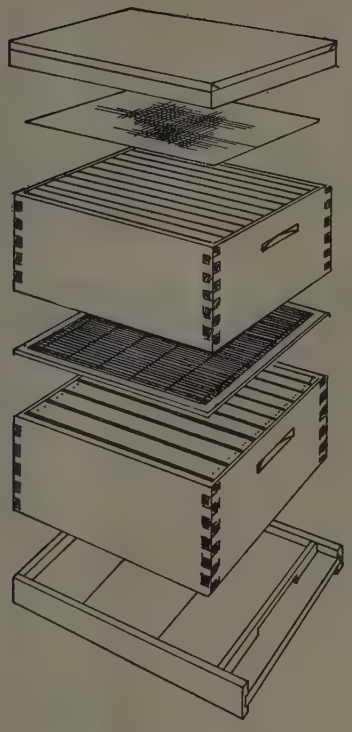


Arrangement of extracted honey hive.

supering", as it is called, should be continued as required until the flow begins to taper off and no further room is necessary. Should it be necessary to give frames of foundation with the second honey super, these may be added next to the brood nest during the heaviest part of the flow, where they will be more readily drawn out into combs for honey storage than if placed higher in the stack, particularly at the very top.

Provision of adequate ventilation is essential during a honey flow and if the bees are observed to be idle and clustering on the front of the hive, the colony should be given more room if necessary and additional ventilation provided by lifting the bottom super off the floor board by use of 1in. blocks. When the flow is finished the extra ventilation should be closed to prevent entry of robber bees.

Standard hive supers as generally used in this country are designed to hold 10 frames. When 10 frames per super are used for extracted honey the combs, because the frames are tightly packed, will be built only as deep as the frame itself. Beekeepers with extractors may find that the use of 9 evenly spaced frames per super will provide a heavier and deeper comb which will be easier to uncap before extracting than the narrower comb produced when 10 frames are used. When foundation only is given 10 frames per super should be used until the foundation is properly drawn out into comb, when 1 frame may be removed if desired and the remainder evenly spaced.

Comb Honey

Though pre-flow colony management for comb honey production is similar to that for extracted honey production, different methods must be used when the flow begins if good results are to be expected. In the production of comb honey only the finest, thin super comb foundation should be used. Drawn combs are not suitable for comb honey production and the bees must be forced to build their combs for the beekeepers' use from foundation only. Comb honey is normally produced either in narrow half frames, 18 15/16in. x 4¾in., or in wooden sections 4⅛in. x 4⅛in. For the beginner the half frame is possibly the most suitable, as the bees will be less reluctant to begin work in this type of frame than they will in the smaller 4⅛in. x 4⅛in. sections. In all forms of comb honey production, particularly section production, the beekeeper if he is to secure a good crop, must impose cramped conditions on the colony. Whereas with management for extracted honey the colony is provided with additional room as required and congestion and overcrowding are avoided, in comb honey production the colony is compressed and forced to accept the half frames or sections in crowded conditions. Imposition of these conditions causes most of the many difficulties in comb honey management.

Colonies selected for producing sections must be really strong. A suitable colony will consist of at least two full supers of brood and bees and should have a young, vigorous queen. Weak hives are useless and colonies of a strain given to undue swarming should be avoided. When there is evidence that the main nectar flow is really starting the colony is reduced to one super and provided with a half super of either sections or half frames. It is usually advisable to set a queen excluder between the brood chamber and the honey supers to prevent the queen from laying in the newly drawn sections.

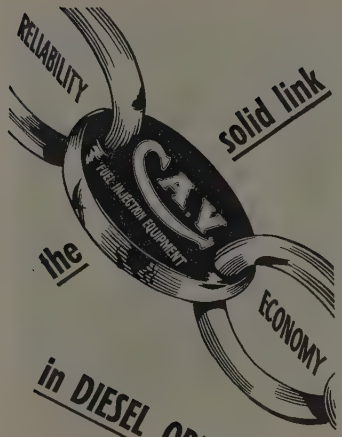
To reduce a colony the brood combs are examined and sufficient combs to fill one super are selected and placed in the lower super. The bees on the remaining combs are shaken or brushed in front of the hive and the spare combs and brood given to another colony or used to make a nucleus. A queen excluder is placed over the brood chamber and a half super of sections placed on top and the lid replaced. The brood selected should consist mainly of capped brood which will hatch shortly and provide the queen with more room. At least one comb with immediate room for the queen to lay should be included. The colony is now deprived of its honey storage space and is compelled to draw the foundation in the sections or half frames. It must be remembered, however, that this manipulation has created an artificial condition of congestion and that the natural reaction of the colony will be to swarm. Eight to 10 days after reduction the colony must again be examined and any queen cells destroyed. At this time, too, it will be seen whether the bees have begun work on the foundation. If none or only a small amount has been drawn and the nectar flow is still well in evidence, it is an indication that the colony is not suitable for comb honey production. At times bees displaying reluctance to begin work on foundation

[*Rendell's*
Bees outside an overcrowded hive.

may be enticed into comb building by placing in the centre section frame a section filled with drawn comb from the previous season. Not all colonies will accept sections and those reluctant to begin comb building in a flow and which do not respond to the "bait" section described above should not be persevered with but should be restored to full-size combs. Most colonies will be found to have begun on the sections, though they may have queen cells. With such the destruction of the cells and the provision of ventilation as described for extracted honey will assist in control. Checks for the existence of queen cells must be made at intervals of not more than 7 or 8 days and continued until it is obvious the colony has settled down to work and lost the swarming impulse.

Colonies should not be reduced to one box until the main flow is well established and the weather appears settled for a few days. Close observation of these points is of the utmost importance, as any interruption to the flow or radical change in the weather will, besides inducing swarming, make the bees liable to tear down and seriously damage the foundation in the sections or half frames.

To produce good, even sections it is necessary to employ strips of sheet metal or thin wood known as separators between the rows of sections. The sections after being built up are placed in wooden frames each holding 4 sections. Each frame should have a separator tacked along one side with a bee space at top and bottom, and the frames are so placed in the hive that there is a separator between each row of sections. The use of separators is essential if good, clean sections are to be obtained. If no separators are used, the bees tend to join the sections together so that when they are removed from the hive the cappings are damaged and the honey leaks out. Though the successful production of section comb honey calls for much knowledge of weather conditions, nectar sources, and bee behaviour, the extra care and attention is well rewarded, for there are few more satisfying experiences in beekeeping than the gathering of a crop of well-filled and properly capped clean, white sections of comb honey.



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Spraying of Potatoes to Prevent Late Blight

INFECTION of potato crops with the fungous disease late blight (*Phytophthora infestans*) has been more prevalent in some districts in the past two seasons and has caused a considerable reduction in yield, particularly in the North Island. There is no cure for late blight, but preventive methods are described here by O. G. Moore, Fields Instructor, Department of Agriculture, Wellington.

THE disease attacks the plant in two ways—through the foliage and stems and through the tubers. Leaf infection is indicated in the initial stages by dark patches which on the under surface of the leaf are surrounded by distinct whitish haloes. Similar dark patches appear on the stems when these become infected. Once a crop is attacked the disease spreads rapidly if conditions are humid and will soon destroy all the leaves and finally the whole plant. If the spores of the fungus wash down through the soil and reach the tuber, tuber infection can follow. Diseased tubers show brown patches just beneath the skin. They are not suitable for storing owing to the rapid collapse of the diseased tissue and the likelihood of secondary infection with wet rots.

Preventive Treatment

There is no cure for late blight. The only treatment is to spray the crop to prevent infection and, if infection is present, to combat its spread to healthy parts of the plants. It is not possible to say exactly when spraying of the crop should begin, but as a general recommendation it should be about 2 weeks before the disease normally appears. According to English literature late blight can be expected to develop when there have been a minimum temperature of 50 degrees F. and a relative humidity not falling below 75 per cent. for at least 2 days. When these two conditions occur the careful grower will arrange to spray within the following week. The number and frequency of sprayings will depend largely on the weather. The aim is to keep a coating of the spray material over the leaves, particularly the under surfaces, and so prevent entry of the spores. In most districts sprayings at 2- to 3-weekly intervals during the critical period of blight attack are sufficient to maintain this protection, but if rain is heavy between the planned times of application, it is a wise precaution to spray immediately after the rain.

Spray Materials

The spray materials used most widely in New Zealand for combat of late blight all contain copper compounds. They are Bordeaux mixture, Burgundy mixture, and proprietary formulations containing copper oxychloride.

Bordeaux and Burgundy spray mixtures are among the oldest sprays known and are yet among the best. Copper sulphate and hydrated lime are used for Bordeaux mixture and copper sulphate and washing soda for Burgundy mixture. The choice of one or the other of these two sprays is a matter of personal preference. Some growers think that Bordeaux mixture is less likely to injure the foliage and others claim that Burgundy mixture adheres better to the foliage and is generally easier to use, as it is not so liable to clog spray nozzles.

[*Sparrow*

There is no cure for late blight. The only treatment is to spray the crop to prevent infection and, if infection is present, to combat its spread to healthy parts of the plant.

Formulations for these two sprays vary widely and are subject again to individual preferences as well as district practices. In New Zealand, Pukekohe is the potato growing area where spraying as a protection against late blight is most widely practised, and the quantities of each ingredient used most commonly in that district, based on information supplied by the local Instructor in Agriculture, are given below:—

Bordeaux mixture: 4lb. of copper sulphate, 4lb. of hydrated lime, and 40 gallons of water.

Burgundy mixture: 4lb. of copper sulphate, 4lb. of washing soda, and 40 gallons of water.

Some growers prefer to do their initial sprayings with mixtures with a lower proportion of copper sulphate to lime or soda and then do further sprayings with concentrations as described. With this procedure they claim that damage to foliage is less likely. Examples of these solutions as sometimes used for initial sprayings are: 3lb. of copper sulphate, 4lb. of hydrated lime or washing soda, and 40 gallons of water; or 4lb. of copper sulphate, 5lb. of hydrated lime or washing soda, and 40 gallons of water.

Mixing of Sprays

The physical properties and powers of adhesion to the plant of Bordeaux mixture and Burgundy mixture are said by some scientific workers to be influenced by the methods employed in combining the copper sulphate with the lime or with the soda. Field trials conducted in New Zealand, however, indicate that comparable fungicidal results can be expected with all methods of preparation except where a concentrated solution of copper sulphate is added to a concentrated suspension of lime or solution of soda and vice versa, or where the concentrated solutions of both ingredients are simultaneously added to the quantity of water required for dilution.

Briefly, the various methods of preparation of both types of sprays may be summarised as follows, the particular method to be employed being left to the user.

1. Add the concentrated suspension of lime (consistency of cream) or the concentrated solution of washing soda to a diluted solution of copper sulphate.

2. Add the concentrated copper sulphate solution to a diluted suspension of lime or diluted solution of soda.

3. Add to one another diluted solutions of each ingredient.

4. Pour the diluted ingredients simultaneously into a third vessel.

Irrespective of the method of preparation the spray should be stirred constantly while mixing is taking place and also thoroughly during use.

It is wise to prepare both these sprays in earthenware, glass, or wooden containers, and both should be used as soon as possible after mixing; otherwise damage to foliage is likely.

The recommended proprietary preparations containing copper oxychloride are certified by the Plant Diseases Division of the Department of Scientific and Industrial Research and are very easily mixed at the strengths indicated on their containers.

It is generally found that approximately 100 gallons of spray per acre are required for adequate coverage of well-developed plants.

Management of Household Poultry Runs

MOST household poultry keepers for various reasons consider that providing a run for their small flocks is almost essential. The run is often essential because the housing provided for the birds is totally inadequate, resulting in far too many birds existing in damp, muddy conditions. In this month's article for the household poultry keeper, H. K. Mullins, Poultry Instructor, Department of Agriculture, Hastings, recommends careful planning of the whole unit, including adequate shade.

A household poultry house with alternative fowl runs and bushes to provide shade during hot weather.

BACKYARD poultry keeping on the intensive system is still rather a novelty in New Zealand, most householders being firmly convinced that a run, however small, will result in better production. That a warm house with plenty of dry litter for the birds to scratch in is entirely suitable for good production is clearly demonstrated on most commercial poultry farms.

Many commercial poultry keepers have ample room in which to run the birds on the semi-intensive system, but they prefer to keep them totally enclosed for obvious reasons. Production is better, the incidence of disease is lower, and the eggs are much cleaner.

The intensive system necessitates the growing of an adequate supply of greenfeed, but this alone is preferable to permitting the fowls to rely solely on the coarse, rank grass which is the only source of greens on many farms. For the good health of the birds and the good quality of their eggs an adequate supply of fresh, luscious greens is imperative. Silver beet and lawn clippings are an excellent source of greens for household poultry keepers and are readily appreciated by the fowls.

Though lawn clippings are crisp and fresh in spring, they tend to become too fibrous during summer, and therefore silver beet provides a better source of vitamin A.

Rotating the Run

By rotating the run each year the householder has an excellent means of providing the birds with fresh ground and at the same time of obtaining well-manured ground for gardening. If the poultry house is built in the middle of the garden, it is comparatively easy to alter the run each year without causing inconvenience to the home gardener. Instead of permanent fencing round the run wire netting can be stretched on wooden frames about 10ft. by 6ft. which can be moved easily and which are supported by stakes driven into the ground. This system is particularly suited to heavy breeds such as Australorps and Rhode Island Reds which are very docile and easily confined.

[*Fraser Niederer*

Fruit trees provide excellent shade in the run.

If a run cannot conveniently be shifted because of the location of the poultry house, it should at least be dug over and limed each autumn. If the run is too small, the vegetation is soon scratched away, the surface becomes brick hard, and rain-water cannot seep away readily. The result is not pleasing in wet weather to the householder or to neighbours. A neat, dry house with plenty of scratching room will not only provide for more winter eggs, but will give the section a better appearance.

Shelter and Shade

Fowls like outside conditions except in heavy winds, but, like most other animals, they appreciate plenty of shade. Where the birds are run on the semi-intensive system it is advisable to plant in each run trees capable of providing abundant shade.

Fowls become lazy in very hot weather. They may need a drink, but will not bother to leave the shade of the yard to find it, and it is therefore advisable to place drinking vessels and food hoppers under the shade of the trees. Fruit trees, especially citrus trees, provide excellent shade and at the same time benefit considerably from the fowl manure in the run. Ornamental shrubs are also useful for shade, and these are better if they shed their leaves during winter.

Ducks as well as chickens require plenty of shade. Losses of ducklings are sometimes extremely heavy through their being cooped up in hot, sunbaked yards. Perching pullets will receive a setback if consistently exposed in small pens to blazing sunshine. Pullets which do best are those having access to shade in the form of hedges and orchards. This is particularly noticeable in late hatched chickens, which seldom rear as well as the earlier hatched ones.

Every aspect of the poultry project should be carefully planned. If the intensive system is used, the laying house should be of adequate size for keeping all the fowls in for at least part of the year. When the rotational system is followed the equipment should be sound and the ground kept fresh or cultivated.

Raising Tobacco Plants from Seed

TWO methods of raising tobacco plants are practised in the Nelson district. Boxes of plants may be bought from a nurseryman and pricked out into beds, or the seed may be sown directly into seedling beds and the plants raised there without any further handling. The latter method is gaining favour and has the advantage of greatly reducing mosaic through less handling of seedling plants. The following article by R. Thomson, Tobacco Research Station, Department of Scientific and Industrial Research, Umukuri, describes methods developed by the Research Station and put into practice successfully by many growers.

THE foundation of a good tobacco crop is a plentiful supply of sturdy disease-free plants, ready at the correct time for setting out in the field. Many diseases and insect pests have their origin in the seedling beds, from where they are carried to the field and disseminated. Uniformity is an important factor and this can best be achieved by providing ample bed area so that there are plenty of plants to pull from. Plants of mixed sizes or varying vigour cause trouble from start to finish. They are unsuitable for use with a planter; and because many weak or diseased seedlings will die, considerable replanting will be necessary, resulting in an uneven crop, with consequent difficulties in harvesting and curing, to say nothing of loss in yield.

Location

The site for the seedling beds should be chosen carefully. It should be close enough to the house or farm buildings to be under constant supervision. A more remote location may have other desirable features, but the site selected should be one that can readily receive attention at any hour of the day, particularly in adverse weather. On the other hand it should not be so close to the bulking and grading sheds that it is likely to become contaminated by tobacco refuse. The proximity of stock, dogs, and fowls must also be considered, and it may be necessary to fence off a desirable location to exclude these.

An adequate water supply is another essential. During growth tobacco seedlings are likely to require frequent watering and if a plentiful and easily applied supply is not available, this important job is likely to be neglected, with disastrous results to the plants. Most water in the Nelson district is from underground sources, and is free from contamination. However, should water from a pond or stream be used, it is essential to make sure that it is not fed by run-off from tobacco fields. The spores of diseases like verticillium wilt and *Phytophthora* canker can be carried by surface run-off, and contaminated water could spread disease to otherwise healthy beds.

The bed site should be well drained, provision being made to get rid of surplus rainfall rapidly. Tobacco plants will not stand wet feet, and a low area or a tight, puggy soil should be avoided. Waterlogging excludes the air from the soil, causing decay of the roots, and the plants soon become yellow and stunted from starvation. Excess moisture is also favourable to the growth of fungi such as those causing collar rot and damping off. When choosing a site it is better to err on the dry side and to have to water frequently than to utilise a poorly drained location.

Shade on the beds at any time of the day should be avoided. The aim is to keep the plants growing rapidly and vigorously, and any shading, with a consequent lowering of temperature and light intensity, will result in soft, weak growth. The location of the beds should be reasonably level, any slope being toward the north so that the beds will receive a maximum of sunlight. Excessive slope will tend to allow water to run on the beds and cause surface washing. A windbreak to the south will keep cold wind off the beds and protect the covers from damage. Windbreaks on any other side are beneficial, but should be sufficiently far away not to cause any shading.

Construction

Beds should run north and south so that both sides receive equal sunshine. Beds lying east and west usually have strong plants along the north side, but plants on the south side become progressively weaker because they are increasingly shaded. Seed-beds can be any length to suit the location. The usual width is 4ft., but a few inches less may be an advantage, as this allows a greater pitch on the covers, which are all a standard width of 54in. This extra pitch allows a better run-off of surplus rain, which is inclined to collect and drip through flat covers.

The sides can be made of 8in. x 1in. timber let 2in. into the ground. They can be stayed by pegs driven in at intervals of about 6ft. It is preferable to use flat pegs, as these cause less wear and tear on the covers and are more easy to cope with should it be necessary to cover the beds for chemical sterilising (see section on sterilising on page 491). Ends should be gable shaped, with the peaks 8in. to 12in. higher than the sides, and a wire should be stretched from end to end to support the calico covers. Tension on these wires is usually adjusted by fastening the wire to a peg outside the end of the bed and driving the peg into the ground to

HEADING PHOTOGRAPH: The foundation of a good tobacco crop is a plentiful supply of sturdy, disease-free plants ready at the correct time for setting out in the field.

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take up the slack. On long beds the small ratchet type of wire strainer has proved very useful for keeping wire tight. Where old bed timber is used it should be thoroughly cleaned down between seasons and preferably sprayed with a 2 per cent. solution of formalin. Old covers should be boiled for 20 minutes as a precaution against carrying over disease from season to season.

The beds should be filled with soil to about half the depth of the boards. The level of the soil inside the beds should always be above that of the surrounding paths so that drainage will be from the beds outward and never the reverse. Soil for the beds should be a free-working sandy loam well supplied with organic matter. Lighter soils will serve, but they dry out more readily and require more attention and more frequent watering. Heavy soils are unsatisfactory. At this stage the beds should be dug or forked over deeply, all lumps broken down, and the surface raked reasonably level.

Sterilisation

When tobacco plants are being raised directly from seed some form of soil sterilisation to kill weeds is almost essential. Depending on the facilities available, one of three methods — steaming, burning, or chemical sterilising—may be used.

Steam Sterilisation

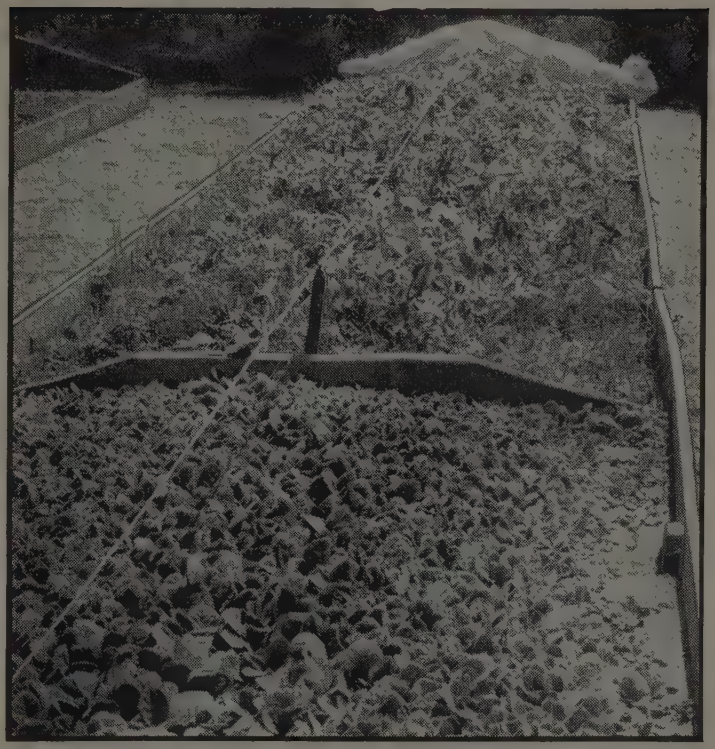
Steam sterilisation is the most effective for the control of both weeds and soil-borne diseases, but it can be carried out only where a steam boiler and equipment are available. For steaming to be done satisfactorily the soil should have about the same moisture content as would be considered suitable for ordinary cultivation. If it is drier, the steam will escape without doing its work, and if it is too moist, the soil will be turned to mud and the structure ruined.

Either the grid method or the inverted-pan method may be used. For steaming a great depth of soil, usually under cover in a shed or lean-to, the grid method is probably the better, but for steaming beds in position the shallow pan is to be preferred. Whichever method is used, the main thing is to raise the temperature of the soil to 200 degrees F. or more and maintain it at that for some time.

The length of time required to do the job will depend on the size of the boiler and the pressure of steam; the governing feature is that the soil temperature must be raised to 200 degrees F. As steaming builds up the ammonia in the soil, with a risk of injury to the young seedlings, it is advisable to allow 10 days between steaming and sowing. Tobacco appears to be less sensitive in this respect than other plants, however, and if this delay is likely to make seeding unduly late, a thorough aeration of the soil by forking over should minimise the risk. The minimum of sterilised soil should be 3in., but more is preferable.

Burning

Piling scrub and brushwood on the beds and burning it will kill weed seeds in the top inch of soil. A more effective method, however, is to dig a pit and fill it with firewood. Sheets of iron are then laid over this and the soil heaped on to them, a wall of sods round the edge generally being used to contain the soil, which is then covered with more iron. The wood is set alight, and by control of ventilation a slow fire is obtained which will last for several days, effectively sterilising the soil.



Steam sterilisation is the most effective method for control of weeds and soil-borne diseases. The bed in the foreground has been steamed and that in the background has been left unsteamed.

Chemical Sterilisation

Methyl bromide: Excellent results have been obtained by this method. The beds are laid down in the usual manner and prepared as for sowing by deep digging over, breaking down of lumps, and raking level. They are then enclosed in gas-tight covers. Plastic sheet about 0.004in. thick is ideal, but laminated building paper will do. The covers are stretched into place over the beds, with a wire or boards running lengthwise to form a ridge. The edges of the covers are sealed all round by soil shovelled on to them.

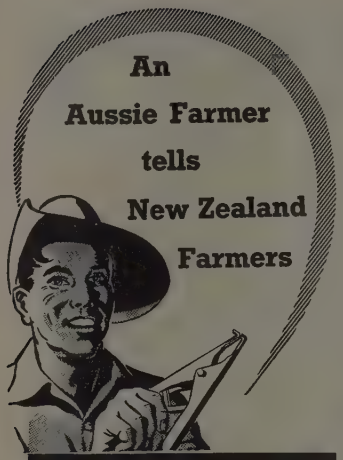
Before the beds are finally sealed it is necessary to provide tubes for introducing the methyl bromide. Two-hundred square feet of bed can be treated at one "shot", and therefore in the ordinary 4ft.-wide bed it is necessary to have delivery tubes for every 50ft. of length. When the methyl bromide is in small containers it is liberated in liquid form. In this case the inner end of the delivery tube should rest in a shallow tray or pan to allow the liquid to collect and evaporate. Large cylinders have both gas and liquid outlets. When gas is used the tray is not necessary. The rate of application is 1lb. per 100 sq. ft. of bed. The covers should be left in place for from 48 to 72 hours, the shorter period being sufficient during warmer weather. There are no toxic after-effects and seed may be sown as soon as the covers are removed.

Methyl bromide is highly poisonous and is colourless and odourless. It can be obtained containing 2 per cent. chloropicrin as a lachrymator indicator and this mixture should always be used.

If it is handled entirely in the open with the operator standing on the windward side of the apparatus and remaining upright all the time (the gas is heavier than air), there should be no undue risk.

Calcium cyanamide is a fertiliser containing 20 per cent. of nitrogen, but it also has given good results in controlling weeds. Applied to the soil in large quantities it is toxic to plant life for some considerable time and therefore must be applied well in advance of the time the seed is sown. For a number of years it was unobtainable locally, but is now back on the market.

The beds are put down and prepared in the usual way. The calcium cyanamide is applied at the rate of 1lb. per square yard of bed. Three-quarters of this amount should be



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distributed over the surface of the bed and forked in; the remaining quarter is then spread over the surface and lightly raked in. This should be done 90 days before the seed is sown.

Moisture is required for the chemical action of the calcium cyanamide and also for the subsequent leaching from the soil, so it is essential to water the beds freely after the application and during the intervening period before seed sowing if rain does not fall. This is most important if toxic after-effects are to be avoided. Most failures can be attributed directly to dry conditions. Because of the high nitrogen content of calcium cyanamide it is advisable to use only superphosphate and potash as fertiliser subsequently.

Where no facilities are available for sterilising it is a good plan to prepare the beds several weeks before they are required, water them thoroughly, and put the covers in place. This method will germinate a lot of weed seeds, which can be killed by frequent hoeings before the beds are seeded. Whatever method is used the land should not be stirred deeply before sowing, as this will only bring up seeds from below and defeat the object of sterilising.

Fertiliser

An adequate supply of fertiliser is essential for the production of vigorous plants, but excess should be avoided or the plants will be soft and sappy. Most of the standard tobacco fertilisers are suitable, but mixtures low in nitrogen should be avoided. The rate of application should be ¾lb. per square yard on steam-sterilised soil and 1lb. per square yard for unsterilised and burnt soil.

Where calcium cyanamide has been used the nitrogen should be omitted from the fertiliser and only superphosphate and potash used. The fertiliser should be broadcast evenly over the surface of the bed and worked in with a rake about a week before seeding. Evenness of distribution is essential; any irregularities will be evident in the subsequent growth of the plants.

Sowing the Seed

Seed is usually sown from the third week in August until the middle of September. This will provide plants from early November. After the fertiliser has been applied the beds should be raked as level as possible and then firmed with a roller or a board. Depressions left in the surface at this stage will cause trouble at subsequent waterings, and a well-consolidated bed is essential for a satisfactory stand. After it is firmed the bed should be watered thoroughly. It is easier to do this job before the seed is sown than to try to make up deficiencies by later watering.

Forty feet of bed should provide sufficient plants for each acre. Well-cleaned seed of high germination should be used. One-year-old seed will usually give a more uniform germination than new season's seed. The usual rate of seeding is 1 level teaspoon to 200 sq. ft. of bed. Teaspoons vary in size, but a medium-sized spoon should be used and the seed struck off level. On no account should this rate of seeding be exceeded; it can be reduced with advantage.

An adequate supply of fertiliser is essential for the production of vigorous plants, but excess should be avoided or the plants will be soft and sappy. The fertiliser should be broadcast evenly over the surface of the bed and worked in with a rake about a week before seeding. Evenness of distribution is essential, as any irregularities will be evident in the subsequent growth of the plants. The illustration shows a bed in the foreground with normal nitrogen, in the centre with excess nitrogen, producing rank growth, and in the background with no nitrogen, resulting in stunted plants.

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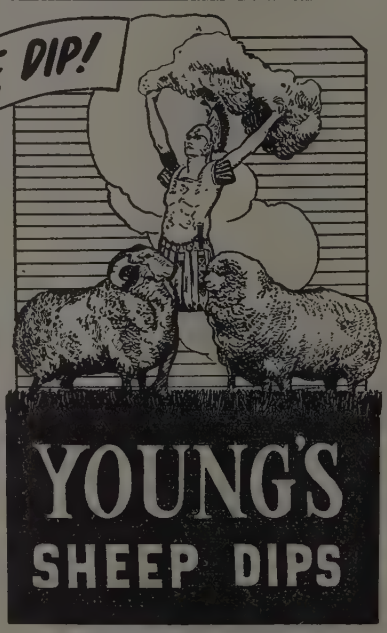

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A good stand of tobacco seedlings. Uniformity in size is an important factor and is best achieved by providing ample bed area so that there are plenty of plants to pull from.

The seed may be sown dry or in suspension in water through a watering can. For dry sowing the seed should be mixed with a quantity of clean dry sand; for each teaspoon of seed about ¼ kerosene tin of sand should be used. The mixture should then be sprinkled thinly and evenly over the surface of the bed, the bed being gone over several times until all the sand and seed are used.

For sowing with a watering can it is first necessary to pre-soak the seed. The seed should be measured out dry in units of quantity required for a bed length and these lots put to soak overnight in clean water. An ordinary 3-gallon can with a coarse rose will conveniently sow a 25ft. length of bed. The can should be filled with water; the measured quantity of soaked seed is then stirred in and watered on to the bed, the can being moved all the time to keep the seed agitated. All the seed will go through with the water and a very even distribution can be secured.

After being sown by either method the seed should be covered with a layer about ⅛in. deep of clean fine sand and watered thoroughly. The sand protects the seed from drying out and also prevents its being moved by heavy watering. The sand used for sowing and covering should be sterilised by steaming or heating, as it is likely to contain weed seeds.

Occasionally it may be desirable to sprout the seed before sowing it, particularly where sowing has been delayed or where the beds have not been sterilised. The sprouting will give the tobacco seedlings a chance before weeds come up. To sprout, the required quantity of seed is first sprinkled on to a piece of damp calico about 6in. square. This is made into a roll and moist flannel is wrapped round the calico and tied in place. The roll is then placed in a warm, not hot, position and kept moist; this may be done by putting the roll in an ordinary preserving jar and screwing the lid on lightly. After 4 days the seed should be examined daily, and when the majority of it is showing tiny white sprouts it may be sown in the usual way.

Management of Beds

The beds should be kept moist until the seedlings are up, and for this a daily inspection is necessary. Many failures are caused by beds being allowed to become too dry. Tobacco seed is very small and tender, and one dry day can seriously injure the germinating seed. This is the chief reason for thoroughly consolidating the ground before sowing; a loose surface dries out more readily than does a firm one. Once the plants are up the beds should be kept sufficiently moist, not unduly wet, to keep the seedlings growing rapidly. It is better to give a few thorough waterings than many light sprinklings. Watering should be done in the early afternoon so that the leaves are dry before evening. Excess moisture brings about conditions favourable to disease.

Adequate ventilation is essential in raising sturdy plants and is the most practical means of keeping in check diseases like moulds and damping off. Once the seedlings are up the ends of the covers should be opened up on fine, calm days to permit a current of air through the beds. As the seedlings grow the beds can be opened fully during the warm part of the day, though it may be necessary at times to protect them from the hottest rays of the sun. From then on the beds can be opened for a longer time each day, until eventually they are covered only at night or during rough weather. More harm will be done by keeping the beds too closed up than by opening them frequently.

About a week before the seedlings are transplanted the covers should be left off night and day and watering reduced to harden off the plants for the field.

Under some conditions the seedlings may be pale and slow in growth. This is more likely on open, sandy soil where the necessity of heavy watering tends to leach out the fertiliser. In such cases a supplementary dressing of nitrogenous fertiliser is required, and nitrate of soda, because of its quick action, is the most suitable. It should be dissolved in water and applied at the rate of 1oz. to the square yard. This should be followed by a watering with clean water to wash the nitrate off the leaves; otherwise burning may result. On account of the risk of burning with nitrate of soda some growers prefer to use dried blood. This should be applied at the rate of 1½oz. per square yard and watered in.

Diseases

The seedling bed is often the source of infection for diseases in the field and therefore every effort should be made to keep the beds healthy. The following are the principal diseases likely to be encountered:—

Angular leaf spot is a bacterial disease which causes the familiar angular markings on leaves of plants in the seedling bed and later in the field, though the symptoms are not always typical and under varying weather conditions the type of spotting may vary. Angular leaf spot can be controlled in the beds by Bordeaux mixture. The mixture should be 3 : 4 : 50 (3lb. of bluestone, 4lb. of hydrated lime, and 50 gallons of water). The first application should be made when the plants are the size of a 3d. coin and should be put on with a watering can at 3 gallons per 100 sq. ft. of bed. It is as important to wet thoroughly the surface of the soil as it is to wet the leaves. This is the reason why the first application should be made so early and why a watering can is recommended in preference to a spray pump. A second application should be made 10 to 14 days after the first, and if stormy, rainy conditions prevail, a third may be desirable. Many growers do not wish to make up small lots of Bordeaux mixture, and these may use any certified Bordeaux substitute such as copper oxychloride or cuprous oxide wettable powders, made up at summer strength according to the manufacturers' instructions. It is essential to weigh and measure the components of a Bordeaux mixture accurately and to keep the mixture well stirred or the foliage may be burnt.

Damping off, a common trouble of seedling beds, is caused by a fungus which spreads rapidly under humid conditions. Diseased seedlings shrivel up and collapse, and after lying on the soil for a day or two disappear. This disease generally affects patches of plants and spreads rapidly. The best method of preventing damping off is to seed thinly and allow plenty of ventilation. Watering should be done in the early afternoon so that the leaves can dry off before the cool of the evening. If the disease is present, the beds should be opened right up even if it means that they temporarily become dry. Patches of diseased plants should be removed with the surrounding plants and all affected soil. The area should then be treated with formalin solution (1 part of commercial formalin to 40 parts of water). Bordeaux mixture as applied for angular leaf spot is of some benefit in checking damping off.

Collar rot is another fungous disease. A black spot appears on the stem at ground level, and as the disease progresses the spot completely girdles the stem. Taking slightly infected plants to the field is frequently the cause of uneven stands and much replanting. If the disease is suspected in the beds, the plants should be looked over very carefully as they are pulled from the beds. Humid conditions in the beds favour the disease, and therefore light seeding and plenty of ventilation are precautionary measures. Sprays have not proved effective, but Bordeaux mixture has afforded slight protection.

Black root-rot is caused by a fungous disease which attacks the roots of the tobacco seedlings. Plants in the beds will generally appear stunted, yellow, and unthrifty. When they are pulled up the root system is seen to be poor with many of the roots showing blackening and rotting. Such infected plants should never be set out in the field, as they may infect an otherwise healthy field. If black root-rot appears in the seedling beds, the beds should be moved to a new site the following year. Efficient sterilisation with steam or methyl bromide will control the disease.

Mosaic: This virus disease is widely distributed and is well known to growers. There is no cure for it, but the raising of seedlings by direct sowing in the beds is the first step in its prevention. Mosaic is spread from plant to plant by handling, and any plan which reduces handling is a practical step toward eliminating the disease. If mosaic is present in a seedling bed, the bed, or at least the affected portion of it, should be discarded, as the disease is certain to be more widespread than is apparent to the eye. Mosaic infection can be removed from the hands by washing with soap and running water. As a precaution it is recommended that when doing work such as weeding or pulling plants workers should wash their hands at regular intervals, particularly after an infected plant has been handled, and after smoking, as manufactured tobacco can carry the virus infection.

Insect Pests

Springtails are tiny black or brown insects about 1/25in. long which jump vigorously like fleas when disturbed; they eat the leaves of the germinating seedlings and often do considerable damage, cleaning out large patches before being detected. They usually enter the beds from surrounding vegetation and weed growth. Spraying such growth with lime sulphur (1 part to 100 parts of water) will clean up this source of infestation. In the beds the insects can be controlled by dusting with derris dust at ½oz. per square yard or 2 per cent. D.D.T. dust at 1oz. to every 50 sq. ft. of bed. An effective control is to spray with nicotine sulphate at 1 fl. oz. to 4 gallons of water to which 2oz. of soft soap and 2oz. of wettable sulphur have been added.

Vegetable weevils are short, plump, pale-green grubs varying in size from a pinhead up to 3/16in. long. They are particularly destructive, as in addition to chewing the leaves they frequently attack the heart of the plant, eating out the growing point. From the seedling beds they can be transferred to the field, where they carry on their destructive work. They may be controlled by spraying with arsenate of lead (1oz. of arsenate of lead powder and 1oz. of hydrated lime to 4 gallons of water) or by spraying or dusting with D.D.T. (**Note:** Wettable D.D.T. preparations vary in strength. The strength required is ½lb. of actual D.D.T. to 100 gallons of water.)

Leaf miner: The seedling bed can be the centre of infection of this troublesome pest. The tiny caterpillars tunnel in between the upper and lower surfaces of the leaf, forming transparent patterns on the leaf, and eventually eat into the heart of the plant. As these insects feed beneath the surface, poisons like arsenate of lead are of no use. Contact poisons which will kill the tiny grub in the short interval between its hatching from the egg and burrowing into the leaf are the only effective means of control. Spraying with D.D.T. at ½lb. of actual D.D.T. to 100 gallons of water or dusting with 2 per cent. D.D.T. dust are the recommended treatments.

Cutworms are tiny pests which sometimes cause trouble in the seedling beds. They are very hard to detect, but if the plants are being eaten and no insects are apparent, cutworms should be suspected. They are best controlled by dusting over the bed with 2 per cent. D.D.T. dust at 1oz. to each 50 sq. ft. of bed.

Slugs can cause extensive damage in seedling beds. Keeping the site free from weeds and rubbish is the first step toward control. Metaldehyde fuel tablets can be used as bait for slugs: One tablet should be crushed up and mixed with a large cupful of bran. This should be sprinkled over the bed or placed in small heaps on the ground; it must be renewed after rain or watering.

Care of Beds between Seasons

As soon as a grower is satisfied that he has completed his replanting his beds should be dismantled and the remaining plants destroyed. Taking up and stacking the boards prolongs their life and usefulness, and destroying the plants prevents the carry over of disease and insect pests from season to season. Many abandoned beds are full of leaf miner and mosaic and are centres of infection for crops.

When not in use the bed site and a considerable border all round should be kept clean cultivated. This will prevent weeds reseeding and slugs and other pests laying their eggs and building up on the site. An alternative is to sow the site with a cover crop. This is quite a good practice provided the crop is turned under not later than early autumn to allow it time to break down in winter, when decomposition is fairly slow.

All photographs by W. C. Davies.

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—*M. A. MacD.*

Growing Celery in the Home Garden

CELERY (*Apium graveolens*) is a native of the marshy places of Europe being known in its wild state as smallage. The only references to its early production seem to be in connection with its use as a medicine. In its wild form it has a spreading habit and a bitter, pungent flavour and odour. The first cultivated plants differed very little from the wild form and most of the early varieties tended to be hollow stemmed. By careful selection and breeding this fault has been almost eliminated. Celery, a biennial of the same family as the carrot, parsnip, and parsley, though a fairly exacting crop, is so popular that it should be grown in all home gardens where suitable conditions can be provided for satisfactory development of the crop. Culture of celery in the home garden is described by S. O. Gillard, Horticultural Instructor, Department of Agriculture, Auckland, in the first part of this article. The section on routine garden work for December is by W. G. Crawford, Horticultural Instructor, Department of Agriculture, Oamaru.

AT first cultivated celery was not blanched or eaten raw, but was used mainly in soups and stews and was thought by many to have slight medicinal properties. It has since become one of the most delicate and delightful of fresh vegetables and is valued for its distinctive flavour and crisp texture.

Celeriac (*Apium graveolens*—variety *rapaceum*), or turnip-rooted celery, is a form of celery which produces large, turnip-like roots and small leaf stems. This type is suitable for cooking mainly.

Celery may be grown on practically any soil type, except the heavier clays; by the addition of organic matter and fertilisers even a moderate clay loam can be made to produce a good crop for home use.

Ideal conditions for celery production include an adequate supply of moisture in a well-drained soil, a relatively cool growing season, especially cool nights, and days of bright sunshine. Owing to its moisture requirements, its production is restricted to regions where rainfall is abundant or where provision can be made for watering.

Varieties

In general there are two types, the green (white if blanched) and the golden or self-blanching type. The former, though not grown to the same extent as the golden type, is hardier and of superior flavour.

Golden Self-blanching is a stocky, very heavy, perfectly solid variety with a splendid flavour. This is the variety mainly grown by commercial growers.

Golden Supreme is a new development in the Golden Self-blanching class, with long stems of good flavour.

White Plume is an early variety of good flavour and is easy to blanch. The leaves are almost white, but are tinted with green at the tips.

Solid White is an excellent late variety which is very hardy. The leaves and stems are green. They blanch slowly and are of good quality.

Culture

In districts except South Otago, where the latest planting should be made in January, plants can be set out in the garden from December to the end of February. Most home gardeners will prefer to purchase plants from seedsmen rather than raise them from seed, but those with a cold frame or small glasshouse can raise plants satisfactorily.

Raising Plants from Seed

Where plants are to be raised seed should be sown about 10 weeks before the plants are required for setting out in the garden. Seed should be sown fairly thickly—about a level teaspoon to a tray (a shallow box approximately 24in. x 12in. x 3in., with several

HEADING PHOTOGRAPH: Celery grows well in beds on the flat if soil moisture can be maintained. Green and Hahn photo.

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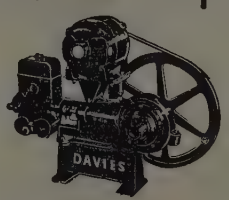

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small holes in the bottom for drainage) filled to within ½in. of the top with fine, moderately rich soil. The seed should be covered very thinly by a sprinkling of fine soil, which should be firmed with a flat piece of board. It is an advantage to cover the trays with paper for the first few days, but the paper must be removed at the first sign of the seed germinating. Seedlings should appear in 1 to 2 weeks and during this period the seed box should be kept moist by careful watering. Weeds should be removed as they appear.

When seedlings are large enough to handle, usually about 3 weeks after they emerge, they should be pricked out 2in. apart each way into seedling boxes. Soil compost for the seedling trays is prepared by mixing together 2 parts of good loam, 1 part of well-rotted animal manure or compost, and 1 part of sand to which has been added a sprinkling of carbonate of lime and superphosphate.

Four to six weeks after pricking out, plants should have made sufficient root growth to enable them, when cut out of the trays in squares, to hold the attached soil. They are then ready for planting out. If they are carefully planted, very little check to growth should occur. The most common mistake that the home gardener makes with celery is failure to allow enough time for growing the plants. It requires 10 to 12 weeks to grow good celery plants such as those shown in the illustration at right.

With very early planting, when soil temperatures are often not above 50 degrees F. for 2 weeks or more after planting (favourable soil temperatures are about 60 to 65 degrees), there is a tendency for the plants to run to seed. This does not always occur if a period of higher temperatures follows before seed-head development starts. However, seed sowing should be timed so that the plants will be ready for planting out after danger of prolonged cold, wet weather is past.

[*Sparrow*

The celery plant at left was planted out directly from the original seedling bed; that at right was transplanted once in good potting soil before being set out in its permanent position.

[*Green and Hahn*

Strong celery plants which have been transplanted out into a box and which are now ready to plant out in the garden.

Lime

Celery, like most vegetable crops, prefers soils that are only slightly acid, and soils that have had no lime for a number of years usually benefit from a dressing of about 4oz. to 8oz. of carbonate of lime a square yard.

Soil Preparation

For the production of celery in the home garden, organic manures such as well-rotted farmyard manure, poultry manure, or compost give best results. This type of manure not only supplies plant food for growing the crop, but improves the physical condition of the soil by the addition of humus. Where farmyard manure or good compost is unprocurable it will be necessary to depend on commercial fertilisers, of which a suitable mixture is blood and bone, 2 parts by weight; superphosphate, 1 part; and sulphate of potash, 1/6 part.

If fresh farmyard manure is used, it should be dug in several weeks before planting. The fertiliser or well-rotted organic manure can be worked into the soil just before planting. It can be spread over the whole area or placed in a band under the plant rows. Unless the soil is very fertile plenty of plant food is required; for instance, a 25ft. row of celery requires about one wheelbarrow load of well-rotted farmyard manure and 1lb. of mixed fertiliser. If only commercial fertilisers are used, these should be broadcast at not less than 1lb. per square yard or applied in a band (strip of soil 12in. wide) at not less than 2lb. to 25ft. of row.

Planting

The seedlings should be watered thoroughly before they are set out in prepared beds or trenches. Trenches are preferable where conditions are dry, as beds are usually more difficult to water. For trenches (20in. wide) the plants are set in double rows 1ft. apart, allowing 8in. between the plants in the rows. Trenches should be shallow, except where it is intended to earth up the plants later for blanching. For early or late crops, plants can be set out on level or slightly raised beds in which are planted 4 or 6 rows 12in. apart with 8in. between the plants in the rows.

Celery plants wilt readily when first set out if conditions are hot and sunny and establish better if planted on a cloudy day and watered to set the soil around the roots. If the plants are large, it is a good practice to cut off the outer leaves about 4in. from their bases before plants are set out.

Celery requires a regular supply of moisture during growth. As it is very shallow rooting (many of the roots are within 2in. or 3in. of the surface), cultivation should be shallow.

Mulching

Mulching the celery row immediately after the plants have been set out will aid materially in conserving moisture and in protecting the roots from the heat of the sun. Fresh manure containing a quantity of short straw is perhaps the best material to use as a mulch, but well-rotted manure or compost is also suitable and stimulates the growth of the celery.

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Blanching

Though it is not essential to blanch celery, most people prefer blanched stalks. Blanching should be started when the plants have attained a usable size. It is done by excluding the sun from the stalks, thus preventing the formation of chlorophyll (the green colouring matter) in the plant cells. As plants that have been fully blanched retain their good quality for a short period, only a few plants should be blanched at a time. In this way a continuous supply of blanched stalks is maintained. If it is intended to harvest the crop over a long period, blanching can begin when the plants are about half to two-thirds grown.

The easiest method of blanching is to surround each bed with 10in. or 12in. wide boards. The boards are laid flat on either side, the inside edges pressed against the plants, and the boards then raised to vertical, thus bringing up all the outside leaves. The boards are kept in position by short stakes driven in on the outsides of them. Another method is to cut sections of brown wrapping paper and to wrap each plant separately, leaving only the tops of the plants exposed. The paper should be passed around the celery plant three or four times and fastened by rubber bands.

When trench planting is practised blanching is usually done by drawing the soil up to the plants, care being taken that none falls into the hearts of the plants. If the soil is left around the plants too long, the crop is likely to lack the true celery flavour. Rots often develop in soil-blanched celery in hot weather and blanching by earthing up is therefore more satisfactory in cool districts or in late autumn.

A good method of blanching celery for the home garden is to place ordinary drain tiles of about 4in. diameter over the plants after they are almost fully grown. To facilitate the placing of the tiles some of the outside leaves of the plants can be removed and the remainder loosely tied together with soft string. The tiles will cause the leaves of the plant to draw up above the top and form a screen which will exclude the light from the interior.

When beds have been prepared for blanching by one of the methods already described they should be top-dressed between the rows with nitrate of soda at ½oz. per square yard. The fertiliser should be watered in immediately. The nitrogen and the water cause the heart leaves and stems to grow rapidly.

[*Green and Hahn*

A bed of self-blanching celery with the board used to exclude sun moved slightly to show the blanching stems.

[*Sparrow*

If grown in autumn, celery in the home garden may be blanched by drawing the soil up against the plants, leaving only the leaves exposed.

Harvesting

Plants are harvested by being cut off just below the crowns, leaving the roots in the ground. The outer leaves are usually coarse, cracked, and of poor quality. For table use approximately half the stalks should be removed, only the best heart stalks being used raw, though the discarded stalks are quite suitable as a cooked vegetable or in soups and stews.

Diseases

There are several diseases which attack celery, but the following are the most common ones:—

Leaf spot (*Septoria apii*): This is one of the most important diseases of celery and occurs throughout New Zealand. All the above-ground parts of plants may be affected. Unless the disease is controlled, plants may be stunted or become unusable. The first symptoms of this disease are small yellowish spots about ⅛in. in diameter on the leaflets. As the spots enlarge the affected tissues turn brown and then nearly black. The edges of the spots are not clearly defined. The spots are also characterised by the presence of numerous black, granular bodies of pin-point size, which are the fruiting bodies of the fungus.

Control: An important factor in the successful control of septoria leaf spot is to clean up and destroy all trimmings from affected crops. Spraying the plants at 10-day intervals with Bordeaux mixture 3:4:50 (4oz. of bluestone and 5oz. of hydrated lime in 4 gallons of water) or with one of the Government-certified copper fungicides will give good control.

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Bacterial soft rot (*Erwinia carotovora*): Soft rot sometimes causes heavy losses. The first symptoms are a water-soaked appearance and softening of the affected tissues. These areas soon turn brown and become very mushy, but the surface remains unbroken. The decay may affect the crown, the leaf stalks, or the leaflets. The rot develops rapidly under warm, humid conditions.

Control: Control measures include attention to garden hygiene and spraying the plants with Bordeaux mixture as for leaf spot.

Black heart or heart rot: The first symptoms are usually brown lesions on the outer margins of the young leaves in the centre of the plant. They may dry out brown or the browning may spread and darken until the heart of the plant is black. Secondary rots may follow.

Control: Attention should be given to hygiene, rotation of crops, balanced feeding, and watering. One cause of the trouble is extreme dryness followed by wetness and usually it is associated with the presence of too much nitrogenous fertiliser.

Cracked stem: The first symptom of this nutritional disorder is brittleness of the leaf stalks and brown longitudinal streaks in the ribs. Transverse cracks then appear over these streaks and the torn outer skin curls and peels backward from the cracks, giving the leaf stalks a roughened appearance. Though the cracks are shallow and narrow, they are usually so numerous that the stalks are unsightly.

Control: Cracked stem can be controlled by applying commercial borax at ½oz. per square yard. It can be mixed with the fertiliser dressing used at planting time.

Insect Pests

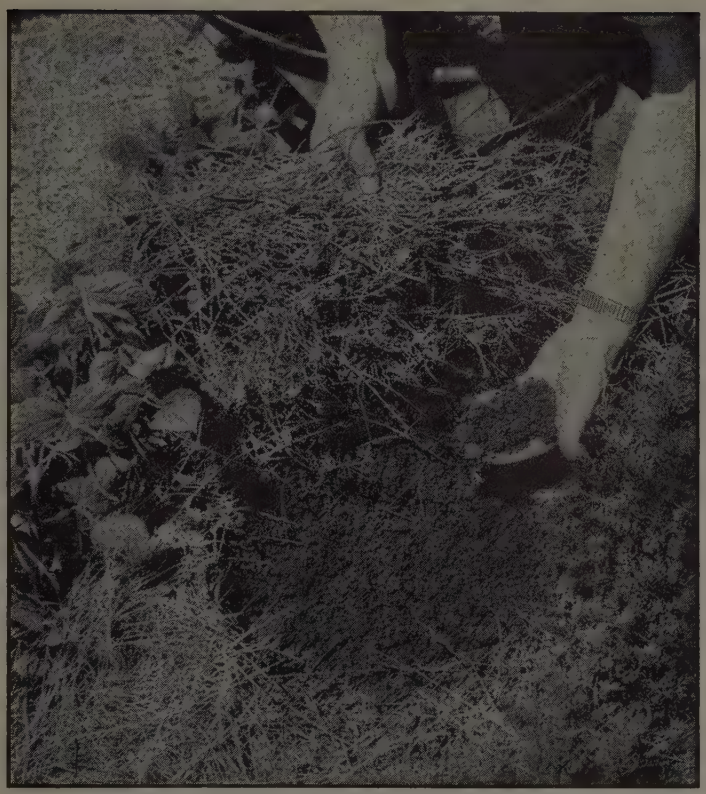
Aphides (green fly): These are tiny, soft, green insects, usually very numerous, which cause wilting of the foliage and stunting of the growth of the plant.

Control: The following sprays are effective: Nicotine sulphate, 1 fl. oz. (7 teaspoons) in 4 gallons of water, to which 2oz. of soft soap or soap powder has been added; H.E.T.P., 4 teaspoons to 4 gallons of water; T.E.P.P., 2 teaspoons to 4 gallons of water.

Precautions

The following precautions should be observed when nicotine sulphate, H.E.T.P., or T.E.P.P. is used:—

1. Avoid contact of concentrate with skin or mouth; use rubber gloves if hands have open cuts.
2. Immediately wash off concentrate spilt on the skin, using soap and running water. After spraying cleanse all exposed parts in a similar manner.
3. Keep the insecticides out of reach of children.
4. Do not eat, drink, or smoke while spraying.
5. Inhalation of spray vapour may cause headaches and tightness of the chest; if this happens, spraying should cease and the area should be vacated.



[*R. W. Orr*

Mulching around plants assists in conserving soil moisture.

Work for December

With the main holiday period approaching, home gardeners should make every endeavour to do as much of the important gardening work as necessary early this month. This applies particularly to those who may be leaving home for 2 or 3 weeks, as there is nothing more discouraging than to come home to find the garden overgrown with weeds. This situation can be obviated largely by hoeing regularly between the rows of plants to destroy the weeds and young germinating seeds.

Frequent hoeing during the dry months is of the greatest assistance to plant growth. Shallow working of the ground destroys weeds and germinating seeds and keeps the surface soil porous, so that rain or water applied artificially finds its way to the roots of the plants. Conscientious efforts with the hoe are often more remunerative in dry weather than is watering.

Watering

How much water should be applied and how often watering should be done are difficult questions to answer, because different plants do not require the same amount of moisture, some soils have a better natural capacity for retaining moisture than have others, and effectiveness of watering will depend on whether a garden is exposed to winds or sheltered. The aim of every gardener should be a uniformly moist and porous soil. Soil taken from 2in. below the surface when squeezed should take the shape of the hand, but when hit with the finger should fall apart. This condition is usually referred to as a potting-stage condition.

Where plants are not making the required amount of growth watering and feeding will often build up the constitution of the plant and give it more vitality. Liquid manures should always be used with discretion and after the soil has been watered. In the main use of them should be discontinued about 2 to 3 weeks before the harvesting period. Mulching around plants, particularly members of the cabbage family (brassicas), during dry spells will do much to keep the soil uniformly moist and improve the crop yield.

Winter Crops

From the latter part of December to early January is the best time to plant out most of the important winter

brassicas. To have success with these crops it is necessary to plant only varieties known to do well in the particular locality.

If the ground is not already prepared for planting, this work should be pushed ahead as quickly as possible. As the crops come to maturity during winter, it is particularly important that the ground should be well drained. If the ground has not been limed, this should be done as early as possible. A suitable annual dressing for most gardens is ¼lb. of carbonate of lime per square yard for light soils and ½lb. per square yard for heavy soils. Half these amounts is sufficient if burnt lime is used. Deeply dug land, provided the subsoil is not brought to the surface, is desirable for these winter crops.

Sowings

Beans: Both dwarf and climber beans can still be sown in most districts. Good varieties of climbers are Fardenlosa and Market Wonder and of dwarf beans Canadian Wonder and Prince.

Swedes: Swedes, which are a good winter vegetable, can be sown now. Superlative and Laings Wonder are favoured varieties for home gardens.

Parsnips: These normally require a long growing season for satisfactory yields. In districts with a mild climate Hollow Crown can still be sown, but elsewhere Ox Heart, a more rapid growing variety, is preferred for December sowing.

Carrots: In the North Island main crops may be sown this month. Recommended varieties are Chantenay and Manchester Table.

Plantings

Tomatoes: The season is getting late for the planting of tomatoes, but where early frosts are not likely Potentate, Moneymaker, and Carters Sunrise may still be planted.

Celery: Celery may be planted in well-manured beds. A good variety for setting out this month is Golden Self-blanching.

Leeks: Leeks may be transplanted during this month or January. A good variety is Musselburgh.

Winter Crops

In the main December is looked on as being too early for the main transplanting of winter greens, January being preferred, but for those wishing to set out plants now the following varieties are recommended:—

Cabbage: Northland and Auckland—Hendersons Succession and Golden Acre. Other districts—Savoy Drumhead and Omega.

Kale: Tall Green and Dwarf Green.

Brussels sprouts: Fillbasket, Scrymgers Giant, and Exhibition.

Broccoli: American Nos. 1, 2, 3, and 4, which provide a continuity throughout winter, or Lily White, Veitches Self-protecting, and Late White.

Show Dates

THE following are dates and venues of A. and P. shows from December to early March:—

NORTH ISLAND

December

4 December—Helensville A. and P. at Helensville.

*4 December—Hauraki A. and P. at Paeroa.

January

*7 and 8 January—Rotorua A. and P. at Rotorua.

14 and 15 January—Wairoa County A. and P. at Wairoa.

*15 January—Marton District A. and P. at Marton.

*22 January—Central Hawkes Bay A. and P. at Waipukurau.

*25 and 26 January—Feilding I., A., and P. at Feilding.

28 and 29 January—Horowhenua A. and P. at Levin.

29 January—North Kaipara A. and P. at Paparoa.

February

4 and 5 February—Rodney A. and P. at Warkworth.

*5 February—Rangitikei A. and P. at Taihape.

5 February—Woodville A. and P. at Woodville.

*8 and 9 February—Dannevirke District A. and P. at Dannevirke.

11 February—Dannevirke Ram Fair, at Dannevirke.

11 and 12 February—Taumarunui and District A. and P. at Taumarunui.

11 and 12 February—Taranaki A. and P. at New Plymouth.

12 February—Pahiatua A. and P. at Pahiatua.

12 February—Hukerenui A. and P. at Hukerenui.

12 February—Waitemata A. and P. at Waiwera.

16 February—Te Awamutu A., P., and H. at Te Awamutu.

18 and 19 February—Ohura A., P., H., and I. at Nihoniho.

18 and 19 February—Masterton A. and P. at Masterton.

*18 and 19 February—Franklin A. and P. at Pukekohe.

19 February—Northern Wairoa A. and P. at Mititai.

19 February—Waiapu P. and I. at Ruatoria.

19 February—Te Puke A. and P. at Te Puke.

19 February—Tauranga A. and P. at Tauranga.

22 February—Otorohanga A. and P. at Otorohanga.

24 February—Matamata A. and P. at Matamata.

25 and 26 February—Wellington and Hutt Valley A. and P. at Upper Hutt.

25 and 26 February—Te Kuiti and District A. and P. at Te Kuiti.

*26 February—Putaruru District A. and P. at Putaruru.

26 February—Waimarino A., P., H., and I. at Raetihi.

26 February—Whakatane A. and P. at Whakatane.

March

2 March—Morrinsville A. and P. at Morrinsville.

5 March—Albany A. and P. at Albany.

5 March—Waiotira Junction A. and P. at Waiotira.

5 March—Mangonui County A. and P. at Kaitaia.

5 March—Opotiki A. and P. at Opotiki.

5 March—Waikato Central A. and P. at Cambridge.

SOUTH ISLAND

December

4 December—Tokomairiro A. and P. at Milton.

*7 and 8 December—Gore A. and P. at Gore.

11 December—Wyndham A. and P. at Wyndham.

11 December—Otago Peninsula A. and P. at Portobello.

14 and 15 December—Southland A. and P. at Invercargill.

January

8 January—Blueskin A. and P. at Waitati.

15 January—Waikouaiti A. and P. at Waikouaiti.

22 January—Palmerston and Waihemo A. and P. at Palmerston.

29 January—Waiau A. and P. at Tuatapere.

February

*4 and 5 February—Otago A. and P. at Dunedin.

19 February—Murchison A. and P. at Murchison.

19 February—Banks Peninsula A. and P. at Little River.

26 February—Kaikoura A. and P. at Kaikoura.

26 February—Maniatoto A. and P. at Ranfurly.

March

*5 March—Temuka and Geraldine A. and P. at Winchester.

5 March—Amuri A. and P. at Rotherham.

* The Department of Agriculture exhibit will be staged at this show.

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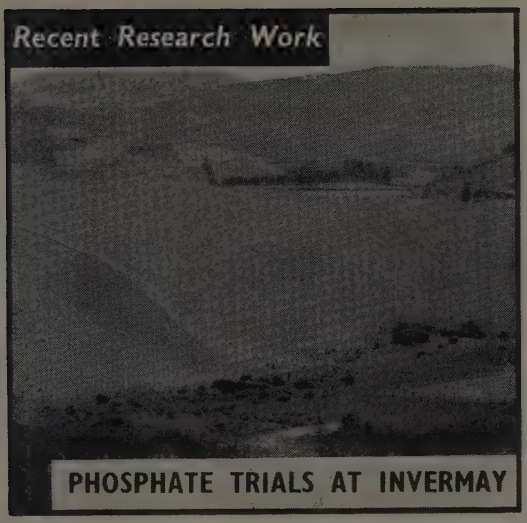
These rates are for glasshouses in good condition with glass of not less than 18oz. Houses of 24oz. glass are insured for 1s. per £100 less than the rate otherwise chargeable.

The first 5 per cent. or £20 of any loss, whichever is the greater, is to be borne by the insured.

Amendment No. 2 to the Earthquake and War Damage Regulations 1944 extended the Act to cover extraordinary disaster damage. This is defined as damage occurring as the direct result of storm or flood where the disaster is of an abnormal and unforeseen nature and is of extraordinary and widespread effect. To obtain the advantage of this insurance the glasshouse must be insured against fire and must be damaged by an extraordinary disaster, as defined in the Regulations. It does not apply to uninsured glasshouses or to isolated losses.

For some years various insurance offices have offered insurance against hailstone damage, which has been of great help to growers. However, experience has shown that both storm and flood damage insurance is needed.

Glasshouse owners interested in storm and flood damage insurance should write to: The Secretary, Earthquake and War Damage Commission, P.O. Box 5038, Wellington.



DURING the past 4 years a number of trials have been laid down on the undulating second-class hill soils at the Department of Agriculture's Invermay Research Station, Otago, to investigate various forms and rates of application of phosphate. The soil type is defined as a silt loam overlying clay and belongs to the yellow-grey earth group. It is deficient in phosphate, lime, and molybdenum. This soil type is very responsive to topdressing and in a highly improved state it will carry 4 or more ewes and their lambs per acre.

COMPARISON OF PHOSPHATIC FERTILISERS

THREE years' results are available from a trial which compared superphosphate, ground North African rock phosphate, and ground Nauru rock phosphate, each applied annually at 3cwt. per acre, and a treatment with an initial dressing of 10cwt. per acre of Nauru phosphate followed by annual dressings at 3cwt. "Thermophos", which is a fused calcium magnesium phosphate produced in the United States of America, and serpentine superphosphate were each included at rates to give a total phosphoric acid dressing equal to that in 3cwt. of superphosphate. Ground limestone at rates of nil, 10cwt., and 1 ton per acre each year were included as main plot treatments. Basic dressings were muriate of potash (1cwt. per acre annually) and an initial dressing of 2½oz. per acre of sodium molybdate.

Superphosphate and "Thermophos" have given pasture yields significantly greater than the rock phosphate treatments and serpentine superphosphate. Nauru phosphate at 3cwt. per acre is the lowest yielding of the phosphate treatments, yielding significantly less than North African phosphate. The rock phosphates treatments have performed relatively better on unlimed ground. The response to superphosphate has been marked, production being more than double the control "no phosphate" in 1952-53. Despite this response, the soil phosphate level, as measured by the quick test method, has not been substantially improved on the superphosphate plots.

Some sward changes are now becoming evident. In the control plots flatweeds and weed grasses (browntop, sweet vernal, and Yorkshire fog) have increased in percentage, and in the best treatments short-rotation ryegrass is prominent.

DRY MATTER YIELDS OF PASTURE HERBAGE FOR 1952-53 SEASON

	Control	Superphosphate 3cwt.	North African phosphate 3cwt.	Nauru phosphate 3cwt.	Nauru phosphate 10cwt.	"Thermophos"	Serpentine superphosphate
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
No lime ..	5,900	9,450	8,450	7,350	8,300	9,450	8,700
10cwt. lime	5,900	10,250	7,250	7,100	7,750	9,550	9,000
1 ton lime	5,850	9,900	7,050	6,250	7,500	9,600	9,400

RATES AND TIMES OF APPLICATION OF PHOSPHATES

The trial of rates and times of application of phosphates was laid down on 9 March 1951 and included three forms of phosphate (superphosphate, lime-reverted superphosphate, and North African phosphate) at rates of application per acre from 1½cwt. to 6cwt., some applications being twice yearly and some annually. Autumn applications were made in February or March and the spring applications in September or October. As the calcium status of the soil has remained high, no lime has been applied since 1950, but a basal dressing of 2½oz. of sodium molybdate was applied to all plots in 1952.

Superphosphate has been the highest yielding treatment in this trial, especially during winter and early spring, but the trial design does not compare forms of phosphate with precision and this superiority of superphosphate has not attained statistical significance.

The other comparisons are made more accurately and these have shown a consistent and significant superiority of the 6cwt. per acre per annum phosphate dressing over 3cwt., the difference amounting to 14 per cent. in 1952-53. High yields have been obtained from the 6cwt. of superphosphate treatments. In 1952-53 these treatments produced over 12,000lb. of dry matter per acre or sufficient to feed about 8 ewes and their lambs per acre. As this yield would be comparable with that from an average Waikato pasture, it indicates the value of heavy initial phosphate dressings and regular maintenance applications on permanent hill pasture on this soil type. This sward is 6 years old. As a result of the high fertility, short-rotation ryegrass is still prominent in this sward and is producing well in winter and early spring.

Yields were not improved by splitting the phosphate dressings into autumn and spring applications rather than applying it all in autumn.

Responses to superphosphate dressings were rapid, the maximum effect being evident about 6 weeks after application. Reverted superphosphate and North African phosphate usually took 3 months or longer to give the most benefit. With the provision of adequate phosphates, lime, potash, and trace elements, second-class hill land similar to that at Invermay should improve rather than deteriorate and retain a high stock carrying capacity for many years.

ALTERNATIVE FERTILISERS TO SUPERPHOSPHATE

This trial was laid down on 8 August 1951 to investigate alternative fertilisers to superphosphate. The sulphur supply position is not secure and it is desirable to investigate phosphatic fertilisers that do not require sulphur in their manufacture.

Several new products and basic slag and granulated superphosphate were included in this trial. The phosphate treatments applied per acre each year were superphosphate 3cwt., and basic slag, granulated superphosphate, "Thermophos", "Fused Tricalcium Phosphate", "Calcium Magnesium Phosphate", oxalic superphosphate, and "Calcium Metaphosphate" were applied at rates to give an equivalent phosphoric acid application to that of 3cwt. of superphosphate. A control plot was also included. A basal dressing of 2½oz. of sodium molybdate was applied to all plots in the trial. "Thermophos", "Fused Tricalcium Phosphate", "Calcium Metaphosphate", and "Calcium Magnesium Phosphate" are all "fusion" products made by fusing phosphate rock with different materials, usually magnesium-containing minerals. Oxalic superphosphate is an experimental mixture in the manufacture of which oxalic acid is used in place of sulphuric acid to react on phosphate rock in superphosphate manufacture.

All these phosphatic fertilisers except "Fused Tricalcium Phosphate" gave herbage yields similar to those of superphosphate. "Fused Tricalcium Phosphate" has yielded slightly but significantly less than superphosphate. In another trial where molybdenum was not applied basic slag gave yields markedly superior to those of superphosphate. This suggests that the small molybdenum content of basic slag may have a beneficial effect in some circumstances.

—N. A. CULLEN

HEADING PHOTOGRAPH: Country at Invermay typical of that where phosphate responses have been secured.

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Milking Goats

THE milking of goats, dairy premises and feed sheds for these animals, and common ailments among goats are described here by A. G. Brash, Veterinarian, Department of Agriculture, Christchurch, and C. P. Harris, Farm Dairy Instructor, Department of Agriculture, Wellington. It is the concluding part of this article on milking goats, the first section having appeared in last month's "Journal".

THE value of goat's milk has long been established. It is almost pure white; the cream rises very slowly and never so thoroughly as in cow's milk. Goat's milk is a comparatively rich milk intermediate in fat content between that of a Jersey cow and a Friesian cow. All milk undergoes a process of curdling in the stomach; with cow's milk the curd is large, hard, and tough, but the curd of goat's milk is small, light, and flocculent, and therefore more easily digested. Goat's milk is said to be digested in the human stomach in 20 minutes, owing to the fine curd and to the fact that the small fat globules are easily assimilated.

For ordinary use goat's milk can be taken fresh and in its raw state with every confidence in its purity and high nutritive value.

Tuberculosis in goats is extremely rare and there appears to be no record of a case in New Zealand or Australia. There is no record in New Zealand of undulant fever being contracted from goat's milk.

One of the most important uses of goat's milk is for the feeding of infants and children showing an abnormal reaction or sensitivity to cow's milk. This may be the cause in some cases of skin troubles such as eczema or urticaria. Children showing an antipathy to cow's milk can often drink goat's milk with impunity, and people who are allergic to beef protein derive benefit from goat's milk.

For general use goat's milk can be utilised for the same purposes as cow's milk and has proved very satisfactory. Next in value to goat's milk is cheese. Some of the most expensive brands of imported cheese are made either wholly or partially from goat's milk. In countries where sufficient quantities are available goat's milk is evaporated, sold in dried milk form, and used when the liquid is not obtainable, thus assuring a continuous supply to patients on a goat's milk diet.

Milk Yield and Lactation Period

The milk yield and lactation period are, of course, very important, as the value of a doe is estimated largely by her milk production. Good does should produce from 8 to 15 times their weight in milk in a lactation period. Goats under test have shown such ratios, and exceptional animals have yielded as much as 18 times their weight. A production of 4 to 6 pints a day for a lactation period of 8 to 10 months is considered within the capacity of an average good milking goat. An average annual yield of at least 1600lb. of milk should be well within the reach of a good commercial herd.

[*Green and Hahn*

Saanen goats being milked by machine on a goat farm near Christchurch.

Milk recording—a means of ascertaining the exact yield of milk from an individual animal during a specific period—is advisable, and for the pedigree breeder and the commercial producer it is essential. For the amateur it adds enormously to the interest of the hobby. Each doe's milk should be weighed and her daily production recorded.

Applications for herd testing should be forwarded to the Herd Improvement Association.

An average analysis for a composite sample of goat's milk is about 4.5 per cent. butterfat and 9 per cent. solids-not-fat.

Milking Routine

The rules for milking are: Speed, regularity, gentleness, quietness, and cleanliness. A normal healthy goat with no obstructions in the teats should not take longer than 3 to 4 minutes to milk. This includes washing and drying the udder and teats before milking. If longer is necessary, the goat has been allowed to get into bad habits and the total quantity of milk will not be so great as when the animal is properly trained. The object of the milker is to teach the goat to have a regular let-down of milk by adopting a regular milking routine. This is of such importance that, with the exception of food and water, nothing will influence the milk yield more. The period between milkings should be divided as equally as possible. A very heavy producer may have to be milked three times a day, but twice is sufficient for most does.

Technique

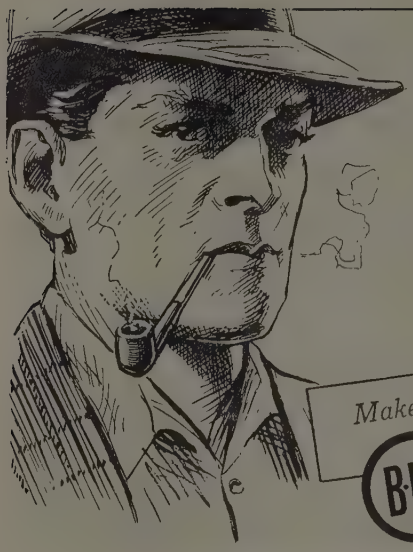
The manner of milking is also important, as the udder, a delicate organ, has to be kept in good shape. Avoid a vigorous up-and-down motion of the hands and forearms. The goat has a softer and more delicate skin than a cow, and generally is much easier to milk. A downward pull or stretching of the teats each time is harmful. If the teat is too small to allow the whole hand to grasp it, then the thumb and the number of fingers which will fit are used. Failure to obtain all available milk will quickly dry off the goat. "Stripping"—the downward pull of thumbs and forefingers on the teats—should be limited to a few times at the end of the milking.

Milking Stands

The goat should be taught to stand quietly while being milked. Owing to the lowness of the animal and difficulty which is experienced in milking at floor level, milking stands 18in. to 2ft. high and a low stool are used, the goat being milked from the side. The head is secured by a collar and short chain or in a miniature cowbail. After the first two or three milkings no difficulty is experienced in getting a goat to jump on to the stand. A little grain fed in a box at the head of the bail encourages it on to the stand. It also supplies a regular feed, and the goat submits to milking with apparent pleasure.

Clipping of Hair

The milking goat should be kept groomed, and if the hair is long and rough on thighs, legs, and udder, clipping is recommended. Should hair get into the milk it will be removed during filtering, but the bacteria on the hair will have gained entry into the milk. Apart from long hairs on the udder and around the teats being a harbour for bacteria, they are a common cause of kicking during milking operations.



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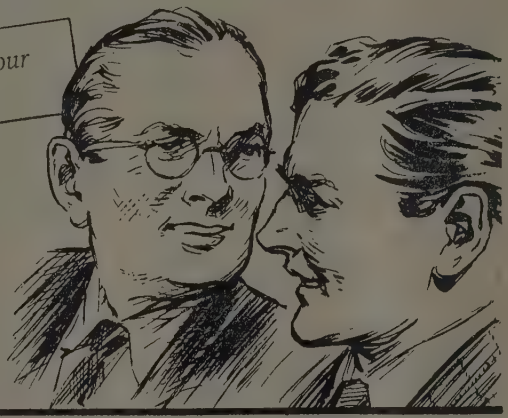

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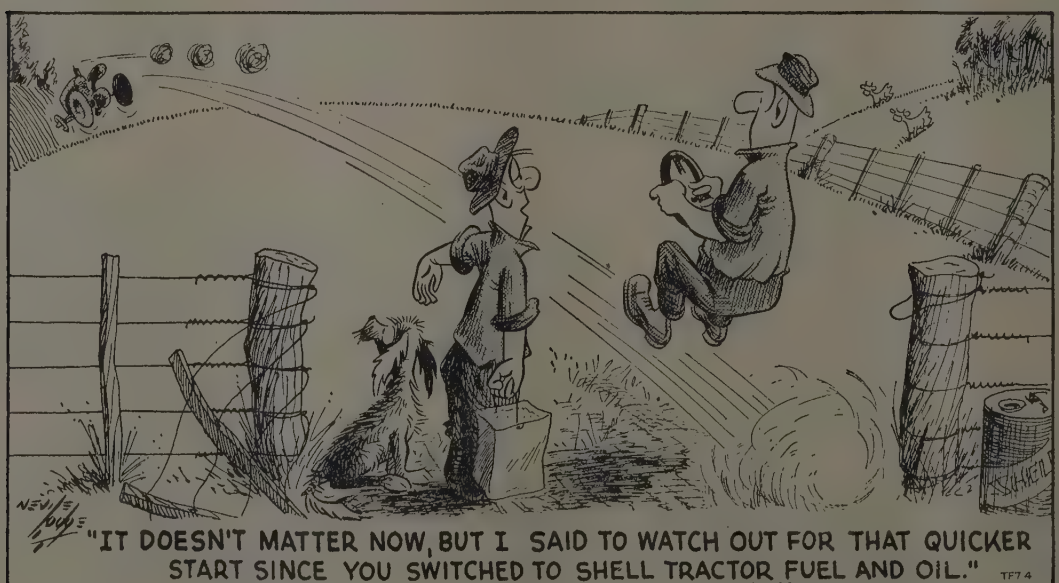

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Producers of goat's milk should remember that milk can readily become contaminated. The utmost care must therefore be given to keeping the stalls, milking premises and surroundings, and all equipment scrupulously clean.

Milking should be done apart from the area where goats are stabled, as this prevents the milk from absorbing odours that may be present. The udder and teats should always be washed with a clean soft cloth and tepid water and finished by wiping them dry with a clean cloth; soft towelling cut into about 1ft. squares is ideal. Every care must be taken to sterilise these in boiling water after each milking. They should then be pegged out to dry.

The washing water should be changed regularly and not allowed to become dirty. The addition of a little chlorine preparation to the water will effectively destroy bacteria associated with mastitis. As the openings in the teats may be filled with foreign matter which will be removed after a little milk has been drawn, this fore-milk should be milked into a strip cup and discarded. The hands should be washed clean and dried. Milking with wet hands is undesirable and unhygienic. Clean overalls should be worn.

All utensils and cloths used must be sterile. Not more than one goat should be milked into a pail and the milk from each should be transferred to a bowl or vat and filtered before being cooled. Milk should not be used for human consumption for at least 4 days after kidding.

Filtering, Cooling, and Bottling Milk

The best method of filtering the milk is to use a modern milk filter, which can be obtained from any firm dealing in dairy equipment. Cloths of any kind are unsatisfactory.

Prompt, efficient cooling of the milk is important. To check the growth of bacteria the milk should be cooled to a temperature not higher than 60 degrees F. as soon after milking as possible. One of the best systems of cooling milk rapidly is to run it slowly and evenly over a small dairy cooler. If the milk trickles over the cooler in little streams, spread it evenly over the cooling surface with a sterile bottle brush used only for this purpose. The milk should then be bottled, capped, and kept in cool storage until required. Filling bottles by the jug or dipper method is not recommended.

If goat's milk is properly produced and handled, it should have no disagreeable odour or goaty flavour. Should such be noticed, the milk should not be used for human consumption. People producing and handling goat's milk should remember that any odour is quickly absorbed by warm milk, and it can readily become contaminated. The principal sources of bad odour or flavours in milk are particles of dirt or hair that fall into it during milking, keeping the does in unclean quarters, and milking in stalls near the buck or in dairy premises that are not kept scrupulously clean. All utensils and cloths used must be kept thoroughly clean and sterile.

Commercial goat keepers or anyone else desiring to sell goat's milk should consult their local Farm Dairy Instructor before starting any construction of feeding sheds and milking premises or altering existing buildings. This will save any unnecessary alteration or expense likely to be incurred.

Housing

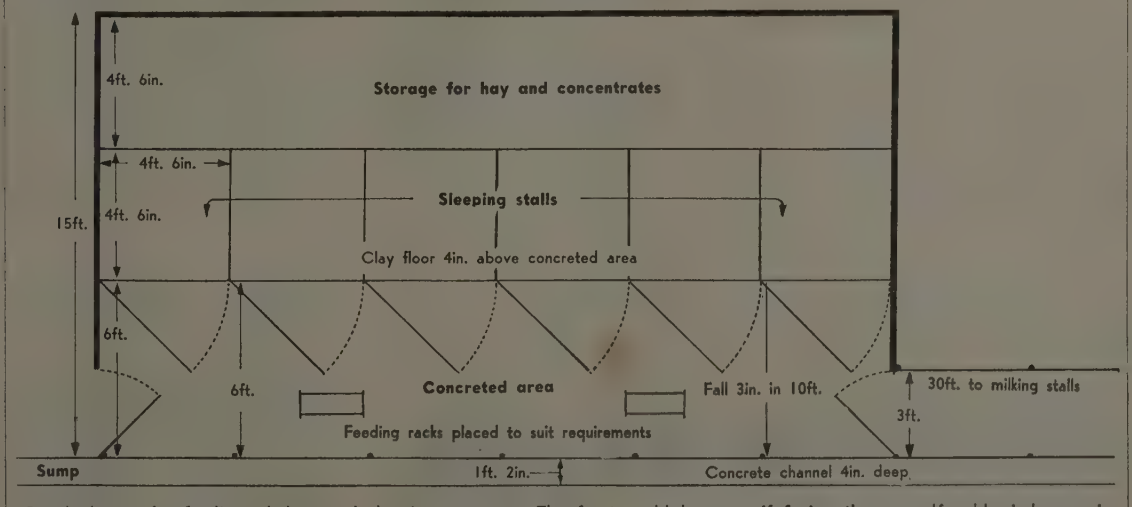
In planning a layout for the milking and dairy premises or a feeding shed it is as well to keep in mind the ideal which, though it cannot perhaps be achieved at first, can be approached.

The natural habitat of goats is the mountainous country of Europe. They dislike wet conditions and take shelter in caves on the mountainsides. For these reasons they must have access to their housing at all times so that they can shelter during showery or wet weather. The housing must be detached from the milking premises and the general layout carefully planned to ensure that the frequent traffic does not provide unsatisfactory surroundings and contaminate the milking premises.

The feeding shed should be constructed according to the size of the herd. The internal layout should be designed to suit the individual owner's requirements, though kidding pens are recommended; also pens for housing the young kids until they are weaned. It is important that where several goats are housed they may be fastened securely to prevent bossing by stronger animals. Separate sleeping and feeding stalls can be arranged by erecting partitions. Pens made from pipe and wire mesh frames are particularly suitable. For cleanliness the stalls should be fitted with raised, movable gratings on which fresh straw for bedding can be placed daily.

It will greatly facilitate feeding if the hay racks, feed boxes, and drinking containers are accessible without the stall having to be entered. Feed boxes and water can be reached by goats through portholes in their pens.

Because a large amount of hay is wasted when it is fed loose, hay racks should be provided in the feeding room. Trays at the bases of racks can be used for feeding concentrates. Battens or piping used for racks should not be more than 2in. apart, or young kids are likely to get their heads between the bars and be strangled.



Simple layout for feeding, shelter, and sleeping quarters. The front could be open if facing the sun. If cold winds or rain are likely to drive in, the front should be partly closed. Each of the sleeping stalls accommodates one goat, and the number of pens will depend on the size of the herd, but extra pens are desirable, as pens can then be spelled during replacement of stale soil. The back wall of the shed is 6ft. 6in. high and the front is 8ft. 6in. high.

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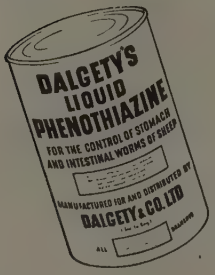

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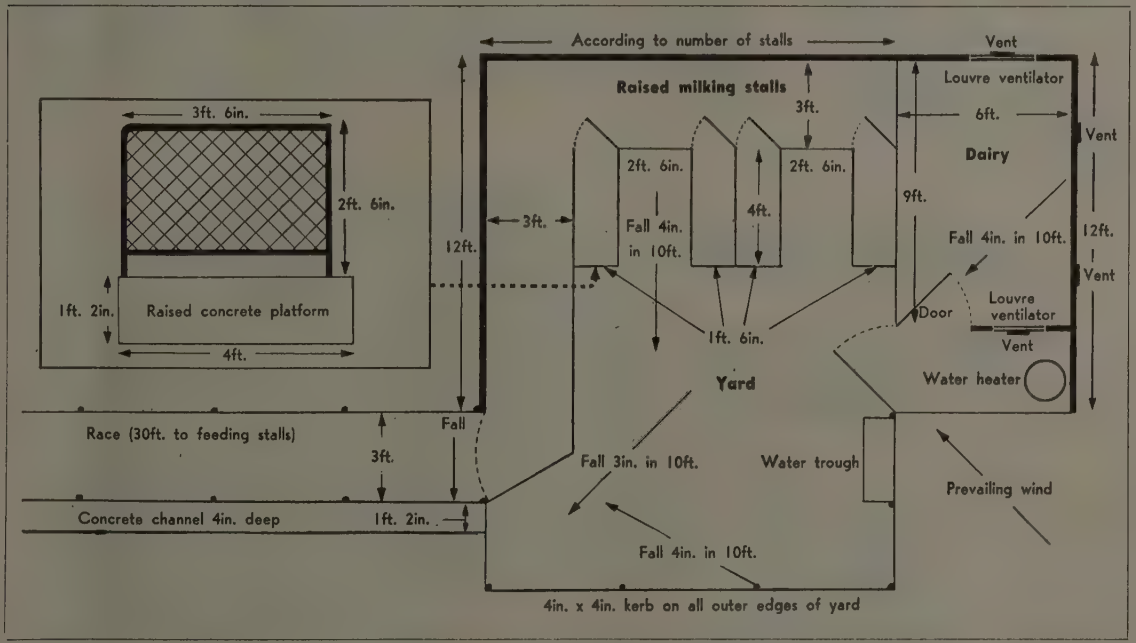
All floors other than in the sleeping stalls should be of concrete with a fall of 4in. in 10ft. to provide good drainage. Some breeders prefer a clay or earth floor for the sleeping stalls, maintaining that the risk of chills is not as great as with concrete. If clay is used, it is necessary to have the floor some inches above the level of the concrete floor to prevent any seepage or dampness when the concrete portion is washed down. The clay or earth is renewed periodically to avoid insanitary conditions. All housing requires cleaning daily and to be provided with fresh bedding. Care should be exercised in the type of bedding used, to avoid the dangerous results from goats feeding on roughage which is mouldy or otherwise unfit for food.

Milking Stalls and Dairy

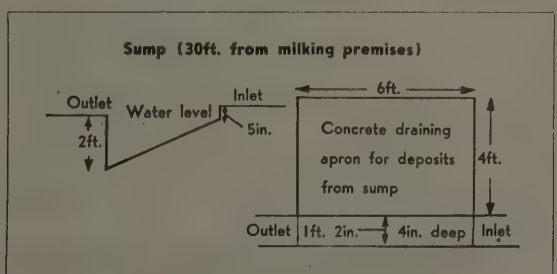
The site for the milking stalls and dairy must be at least 30ft. from the feeding or housing quarters. The dairy should be built on the prevailing wind end and stock must not enter the yard past the dairy. To maintain clean and sanitary surroundings a fenced concrete control race 3ft. wide leading from the feeding quarters to the milking shed is necessary. All drainage from the dairy and milking

[*Green and Hahn*

Before milking, the udder and teats should be washed with a clean cloth.



Layout of milking premises for goats. Walls should be of concrete for at least 4ft. above the floor. All interior surfaces of concrete walls should be plastered to a smooth finish with a steel tool. All other interior surfaces of the dairy should be lined with a non-porous material. Ventilation must be provided on two walls in the dairy, the area of ventilation to be at least an eighth of that of the floor. All ventilators and doorways should be screened against flies.



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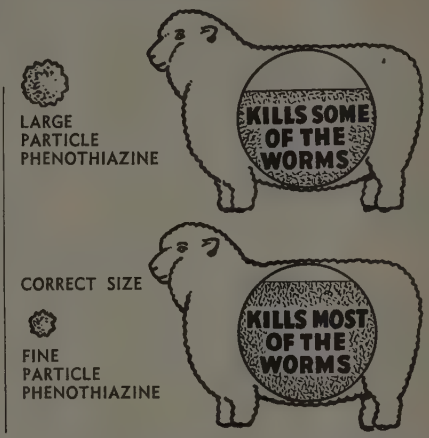

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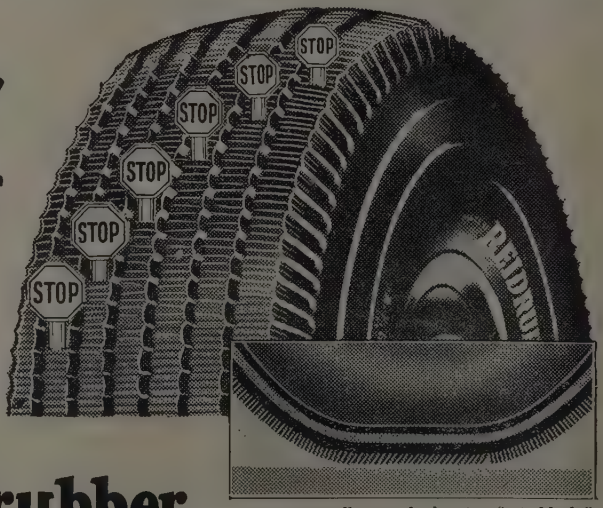

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premises is carried in a channel alongside this race, uniting with the drainage from other buildings.

The main essentials for any milking shed are convenience for milking, provision for efficient cleaning, and good drainage. Concrete floors, walls, milking platforms, and yard should be easy to wash and keep clean. Pipe stalls last longer and are more easily cleaned than wooden ones. A concrete trough outside the dairy will provide ample water for washing down and can be connected to receive the discharge water from the milk cooler. Whether the yard area is under cover will depend on the climate.

Dairies must be amply ventilated, vermin and dust proof, and of sufficient size to house all the necessary equipment. There should be benches and racks to keep everything off the floor. The water heater if installed outside prevents any steam or heat nuisance inside the dairy.

Movable Shelter Houses

Shelter houses built on sledges serve many useful purposes. Fenced runs are necessary for the kids after weaning, for rotational grazing, and to separate the bucks. They can be used to advantage as extra winter quarters and for shelter in the other seasons. The floor space is 6ft. x 6ft. The back wall is 5ft. 6in. high, the front wall 6ft. 6in., and there is an overhang of 2ft. 3in. The front is boarded up 4ft. and the remainder covered with wire netting. The house is divided into two compartments by boards to a height of 4ft., and wire netting. The walls must be draught proof. At each end there are four feed pens, one at each side for concentrates and two in the centre for lucerne hay. There is a lid above the feed pens to enable feeding to be done from outside. A raised wooden grating is hinged on the back wall to provide for straw bedding and easy cleaning. There is a container for drinking water on the dividing wall and a box for lick in the front wall.

Type of movable shelter house.

Long hair should be trimmed from the udder.

Common Ailments of Goats

Local officers of the Animal Industry Division should be consulted for advice on the health and management of goat herds.

Though by no means delicate goats are subject to disease. However, if consideration is given to correct methods of care and management, hygiene, and feeding, many ailments can be avoided. The diseases of goats are closely allied to those of sheep and in general the treatment is the same for both.

Fortunately tuberculosis in goats is very rare, especially in New Zealand. Kids could, however, be infected with milk from an infected cow. Infection of goats with the organism of contagious abortion (*Brucella abortus*) is also almost unknown. This fact has no connection with the old and unfounded belief that running a goat with a dairy herd helps to prevent contagious abortion in cows. *Brucella melitensis* infection, the cause in some countries of the serious disease in human beings called Malta fever, does not occur in New Zealand.

Worm Infestation

Worm infestation is the commonest trouble in goats and can be the cause of much loss where steps are not taken to control it. Goats are affected mainly by the same species of worms as are sheep and these worms are mostly interchangeable. As worm infestation is usually difficult to detect in the early stages, trouble should be anticipated by regular treatment before symptoms appear. Where worm infestation is suspected samples of the droppings can be examined by a veterinarian to determine the degree of infestation. Kids are most susceptible. The most constant symptoms are progressive loss of condition with harsh, staring coat and loose or fluid droppings. Diarrhoea may not always be present and in some animals severe infestation may be accompanied by constipation. There is also a progressive reduction in milk supply and gradual loss of appetite. In all cases where the cause of death is in doubt a veterinarian or Livestock Instructor should be called in.

Treatment and prevention: Phenothiazine treatment is safest and best. Treat kids as soon as they reach 3 months and all does 2 weeks after kidding. In severe infestation repeat all doses after an interval of a fortnight. Treatment may be repeated throughout the year as found necessary, but the whole herd should be treated at least twice a year. Do not treat does within a month of kidding, as dead kids may be born. Full doses of phenothiazine will discolour the milk, the pink discoloration developing after the milk has been exposed to air for a few hours. Milk obtained within 48 hours after dosing should be discarded. White goats when treated with phenothiazine should be protected from direct sunlight for 48 hours after treatment. A goat that does not tolerate the treatment well may have the dose over a week or 10 days.

Use the following dose rates for phenothiazine: Adults, 1½oz. of powder; 12 to 18 months, 1oz.; 8 to 12 months, ¾oz.; and 3 to 8 months, ½oz.

Good feeding will help to increase resistance. Avoid overstocking of pastures and do not stock damp areas heavily unless goats are treated every 6 to 8 weeks with phenothiazine.

At the first signs of worm trouble the time allowed for grazing should be limited, especially if pastures are wet. Hand feeding with hay and concentrates under clean conditions should be increased until the goats recover. Rotational grazing should be practised where possible. A rest of even 4 to 6 weeks will reduce infection on pastures greatly. Use may be made of the electric fence for controlling grazing and goats will appreciate changes to fresh areas.

Diarrhoea

Diarrhoea is seen in adults as well as kids. In adults it may be due to

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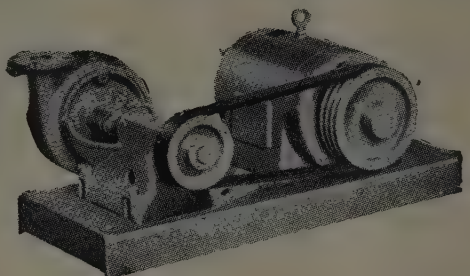

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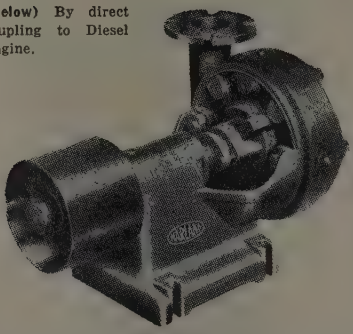

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worm infestation, ingestion of certain weeds (such as dock and sorrel), or rapid changes from one type of feed to another. Treatment consists in removing the cause.

In kids, diarrhoea may be due to worm infestation or to digestive disturbances caused by faulty feeding. Where kids are being hand reared diarrhoea may be caused by overfeeding, feeding at irregular hours, or the use of dirty bottles. Cow's milk may be fed diluted by adding 25 per cent. of water. Diarrhoea due to digestive disturbance should be treated first by giving a purgative such as ½oz. of Epsom-salt and a level teaspoon of ginger in ¼ pint of water, or ½ to 1oz. of castor oil. Give only boiled water for one feed; then reintroduce the normal feeding gradually. More severe cases may require treatment with sulphamezathine (a veterinary prescription is required), which is excellent where bacterial infection or coccidiosis is the cause of the diarrhoea.

Enterotoxaemia or Pulpy Kidney

A condition similar to pulpy kidney in lambs may occur in goats of all ages, but more commonly in goats from 6 months to 2 years old. Two forms of the disease are recognised. The acute form nearly always ends fatally within 36 hours; its onset in milking goats is usually marked by a sudden drop in milk yield, loss of appetite, and severe and sometimes blood-stained diarrhoea. The chronic form is characterised by bouts of diarrhoea and marked depression and usually lasts for 7 to 10 days; affected goats often recover after a short convalescence.

The disease is often associated with sudden changes of feed, especially changes on to grass or greenfeed crops, and these should be introduced gradually. The response to vaccination is not as good as in sheep. Treatment with sulphamezathine has proved very effective if administered at the first signs of diarrhoea, which usually precedes deaths from enterotoxaemia.

Mastitis

Despite the highly developed state of the udder in goats, mastitis is not often a cause of serious loss. The bacteria found are similar to those causing mastitis in cows, streptococcal and staphylococcal infections being most common. In the acute forms there is heat, pain, and swelling of the affected side. In a severe form of staphylococcal infection known as gangrenous mastitis the affected quarter turns black and cold. Treatment of this type is difficult and the aim should be to prevent further spread.

Chronic infections may give rise to hard fibrous tissue. Changes in the milk vary from the presence of a few flakes or clots up to greatly altered secretion. Infection may sometimes be present without apparent alteration in milk. This may be the cause of a bad reductase test and requires investigation and treatment. Preventive measures include attention to good hygiene such as washing the hands and teats both before and after milking and keeping the shed clean. Affected does should be isolated and milked last into a tin containing disinfectant.

The best treatment in most cases is the injection through the teat of penicillin, streptomycin, or aureomycin preparations from the tubes used for the treatment of mastitis in cows.

Retention of Afterbirth

Retention of afterbirth is not uncommon in does which have had a difficult kidding. In no circumstances should the afterbirth be pulled away, as manual removal is difficult and dangerous and is undesirable and unnecessary. Washing out with a warm antiseptic solution is often of great assistance. It should be done within 24 hours or so, before the opening into the uterus or womb has closed. If this is not successful, veterinary assistance should be sought, as treatment with drugs such as sulphamezathine or penicillin will often prevent blood poisoning.

Suitable type of sleeping pen. Each pen is 4ft. x 5ft. with 3ft. 6in. high sides.

Cystitis or inflammation of the bladder is a complication which may also follow kidding. It is indicated by the constant passing of urine with straining, and treatment of it requires veterinary assistance.

Milk Fever

Milk fever is usually seen just after kidding, but may occur just before or even several months after. It is more common in heavy milkers at second, third, or fourth kiddings. The high milking propensity of the goat renders it particularly susceptible to milk fever. The onset of symptoms is sudden, the doe often being found down and more or less unconscious. The early symptoms of lassitude, loss of appetite, or unsteady gait may not be noticed. Breathing is slow and shallow.

Treatment is by the injection of 2oz. of the standard 25 per cent. solution of calcium borogluconate. The injection should preferably be given into a vein by a veterinarian, but may be given subcutaneously, that is, under the skin. Prevention is difficult, as calcium intake in the food has little or no effect on the blood calcium level. The does should not be milked out completely for the first 2 or 3 days.

Impaction and Constipation

Impaction and constipation are seen mostly in older adults which are overfed and under-exercised. Dry, hard feed, fibrous feed, and absence of greenfeed are common causes. Impaction is first noticed when chewing of the cud ceases; there is a tendency to bloat, appetite disappears, and dullness sets in.

Affected animals should be provided with greenfeed and drenched with 2oz. of Glauber's salt or Epsom-salt in a pint of water to which has been added a tablespoon of molasses.

Bloat

Usually bloat occurs when goats are on succulent greenfeed, especially clover or lucerne. Some goats are apparently more susceptible than others.

For treatment pull the tongue as far forward as possible to induce the passing of gas or pass a narrow rubber tube down the gullet. Give a teaspoon of vegetable oil of turpentine in ½ pint of milk.

Laminitis

Laminitis or founder may be caused by excessive feeding on grain or travelling on hard roads with badly trimmed feet. Acute lameness is always a symptom. The animals refuse to walk and usually progress on the knees. The feet are hot and tender. Hooves grow long and unless trimmed become misshapen.

For treatment give laxatives such as 2oz. of Glauber's salt or Epsom-salt in water and reduce concentrates in favour of greenfeed. Allow the goat to stand with the feet in a cold bath with ice if it is available.

Foot-rot

Goats may occasionally become infected with the contagious form of foot-rot, which causes the common condition in sheep. Foot-rot usually starts as an inflammation between the claws and spreads to the sole or wall of the foot, causing the horn to separate from the underlying tissues.

Affected goats should be isolated and treated by carefully removing all loose horn and immersing the foot in a solution of 1 part of formalin to 10 parts of water.

Ophthalmia

Ophthalmia (pink eye) is similar to pink eye in sheep. It begins with a watery discharge from the eyes and inflammation of the lining membranes of the eyelids. In severe cases a bluish-white film develops on the eyeball.

For treatment apply a few drops twice daily of 10 per cent. argyrol or ½ per cent. zinc sulphate solution. Penicillin eye ointment is also useful. Isolated cases of pink eye are more likely to respond to penicillin than the highly infectious type, which spreads through the herd quickly and affects many animals at one time.

Sore Teats

Chapping and cracking of teats occur usually in winter and spring. They may occur when the teats are not dried after milking and are exposed to cold conditions. Teat injuries may also be caused by thorns and barbed wire.

For cracked teats apply the following ointment after milking: Salicylic acid 2 drams, benzoic acid 1 dram, lanolin 6 drams, and sufficient petroleum jelly to make a mixture up to 2oz.

Goat Pox

Goat pox is similar in cause, course, and symptoms to cow pox. The first sign is the appearance of reddish circular areas about ¼in. across on the teats or udder. These later become raised as watery blisters and progress to pus-filled pox lesions. After a few days these are replaced by scabs which finally fall off, leaving white sunken areas. Sometimes the end of the teat may be affected. Goat pox is transmissible to human beings and the typical stages are seen usually on the hands. Once a goat has had the infection it remains immune for life against further attack.

Treatment

A compound of equal parts of tincture of iodine in glycerine or 3 per cent. salicylic acid in glycerine is a useful application. The ointment given for sore teats may also be used.

Scabby Mouth

A condition similar to scabby mouth or contagious ecthyma in sheep may sometimes occur in goats. The course of the disease on the lips is similar to that described for goat pox on the teats. Kids particularly are affected, but when recovered are immune from further attack. The affected areas may be treated with a lotion of equal parts of tincture of iodine and glycerine.

Poisoning

The ability of goats to reach up to quite considerable heights and their habit of nibbling at accessible trees, shrubs, and plants render them possible subjects for plant poisoning. However, it is usually found that few goats eat poisonous greenery in sufficient quantity to harm them unless they are tethered near it. Rhododendron and yew are exceptions which may be readily eaten and cause severe illness or death. Among other plants which may cause poisoning are laurel, daphne, iris, hemlock, and spurge. It is doubtful if laburnum ever causes poisoning in goats, as they pointedly avoid eating it.

In most cases of plant poisoning the symptoms include salivation, diarrhoea, abdominal pain, dullness, and possible straining. If plant poisoning is suspected, no time should be lost in getting in touch with a veterinary surgeon.

Goats, like other animals, may ingest chemical poisons that have been left lying about. The poisons most likely to be encountered are arsenic and lead compounds, strychnine, and phosphorus.

Lice, Ringworm

Two types of lice may infect goats, a biting and a sucking type. Kids are most susceptible, heavy infestation in adult goats being restricted to those in weak and unthrifty condition. The skin is dry and scurfy and constant rubbing leads to a rough appearance. Complete control can be obtained easily by the use of benzene hexachloride or D.D.T. dusting powders. One treatment with these powders is usually sufficient. Goat lice cannot live on sheep.

Ringworm is caused by a fungous growth on the skin or in the hair follicles. The hair falls out, leaving circular bare areas. Wash the affected areas thoroughly with warm water to which washing soda has been added at the rate of 1 tablespoon to a gallon, and when they are dry apply a 2 per cent. solution of photographic hypo (sodium hyposulphite) or tincture of iodine.

Grading Points for Export Butter and Cheese

BUTTER-MANUFACTURING companies which obtained an average grade of 93.75 points or more and cheese-manufacturing companies which obtained an average grade of 92.50 points or more during the year ended 31 July 1954 are listed below in order of merit. Of the total listed the 20 butter factories and 10 of the cheese factories are in the North Island and the remaining 5 cheese factories are in the South Island. Production figures are for the balance-sheet year 1953-54 and the figures of quantities graded for export are for the period 1 August 1953 to 31 July 1954.

Creamery Butter

Factory	Registered number	Brand	Production tons	Graded for export tons	Average grade points	Grading port
United	1296	Whariti	563	160	94.256	Wellington
Cheltenham	3	Pakeha	1689	1042	94.187	Wellington
Wairoa	1345	Wairoa	543	136	94.182	Hastings
Te Aroha-Thames Valley	344	Overseas	3260	2354	94.164	Auckland
Raetihi	717	Raetihi	320	208	94.111	Castlecliff
Taihape	1188	Tikapu	232	108	94.000	Castlecliff
Wangaehu	1326	Wangaehu	575	378	93.997	Castlecliff
Kuku-Manakau	905	Ohau	516	324	93.981	Wellington
Masterton	1307	Masterton	767	499	93.977	Wellington
Konini	1203	Konini	1540	857	93.966	Wellington
N.Z. Dairy (Morrinsville)	415	Anchor	3215	3078	93.943	Auckland
N.Z. Dairy (Frankton)	1510	Anchor	5480	2446	93.941	Auckland
Levin	910	Lake	1855	846	93.924	Wellington
Cambridge (Hautapu)	1239	Cambridge	2643	1541	93.898	Auckland
Okitu	1270	Okitu	155	71	93.889	Gisborne
Rangitikei	1360	Rangitikei	974	625	93.856	Castlecliff
Moa Farmers'	341	Inglewood	2160	1627	93.837	New Plymouth
Kairanga	1768	Longburn	1203	598	93.816	Wellington
Kia Ora	926	Kia Ora	901	402	93.815	Gisborne
Rodney	394	Rodney	869	804	93.769	Auckland

Butter companies whose butter was graded mainly for the local market and for which an average grade of 93.75 points or more was obtained for the combined local and export gradings were as follows:—

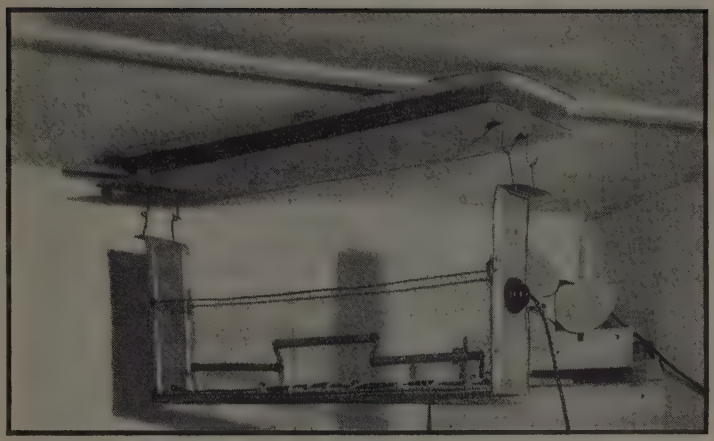
Factory	Registered number	Brand	Production tons	Graded tons	Average grade points	Grading port
Westland	145	Westland	—	556	94.395	Lyttelton
Karamea	1570	Karamea	409	327	94.162	Lyttelton
Kaikoura	302	Kai	610	462	94.137	Lyttelton
Murchison	1888	Airship	484	377	94.095	Lyttelton
Inter-Wanganui	6	Inter-Wanganui	—	257	94.091	Lyttelton
Rangiwahia-Ruahine	750	Quail	164	41	94.063	Wellington
Collingwood	1254	Golden Hills	482	439	94.047	Lyttelton
Golden Bay	146	Sovereign	953	820	94.032	Lyttelton

Cheese

Factory	Registered number	Brand	Production tons	Graded for export tons	Average grade points	Grading port
Wright's Bush	206	Wright's Bush	216	217	93.403	Bluff
Bruntwood	1534	Bruntwood	926	907	93.079	Auckland
Dalefield	9	Dalefield	1229	1189	92.959	Wellington
Parkvale	1240	Parkvale	398	398	92.674	Wellington
Kaupokonui (Oeo)	1132	Kaupokonui	711	711	92.644	Patea
Woodlands	1485	Woodlands	207	192	92.644	Bluff
Belvedere	486	Belvedere	489	490	92.609	Wellington
Edendale	86	Premier	765	780	92.602	Bluff
Featherston	360	Featherston	1612	1550	92.568	Wellington
Morton Mains	1604	Morton Mains	190	190	92.568	Bluff
Greytown-Wairarapa	529	Greytown	893	808	92.522	Wellington
Aparima	188	Aparima	378	376	92.519	Bluff
Brooklands	1619	Brooklands	437	435	92.511	New Plymouth
Alton	1890	Alton	815	813	92.507	Patea
Oaonui (Kina Road)	283	Oaonui	428	422	92.504	New Plymouth

Hazards in Beekeeping

ASSOCIATED with most industries are certain risks which cannot be entirely eliminated. These risks are known as occupational hazards and each year they are the cause of much material loss and numerous accidents to workers. Though the beekeeping industry is relatively small when compared with others, it also has its occupational hazards. There are no statistics which accurately show beekeepers' previous fire and accident records, but it is known, especially in regard to honey house fires, that many beekeepers have sustained severe financial loss. In this article, E. Smellie, Apiary Instructor, Department of Agriculture, Auckland, draws beekeepers' attention to the dangers of their work and indicates measures by which risks of physical accident and loss by fire wastage can be reduced.



[*Palmer*

Fire prevention in use of electrical equipment. A heater (foreground) and a fan (background) in a hot room. An asbestos baffle board has been fixed between the heater elements and the ceiling lining.

THROUGHOUT the history of beekeeping in New Zealand beekeepers have always been quick to assess and adopt the advantages of new power-driven machinery and appliances for honey producing, extracting, and conditioning. Though this utilisation of up-to-date plant has enabled individual beekeepers to produce and process greatly increased tonnages of honey, a complete establishment is very costly, and for the average commercial beekeeper the ideal plant is usually achieved in stages over a period of years. It is important, therefore, when extensions and other adjustments to plant are made at various stages of development that the work undertaken accords with a master plan which determines the requisites for the design, arrangement, and equipment of the finally completed honey house.

When time and finance are limiting factors during the development process necessary extensions to premises and other essential modifications to honey house plant are sometimes undertaken at the dictates of urgency and expediency. In many instances adjustments made under these circumstances provide neither convenience nor the necessary safety precautions. For this reason these arrangements at the time are considered temporary but when, as frequently happens, they are allowed to become permanent, they have been responsible for some of the more serious honey house fires and physical injury sustained by beekeepers.

When lack of finance is the only reason for the existence of expedients, they could perhaps be condoned if fire or other injury was likely to result only from the owner's own negligence. However, when beekeepers consider the possibilities which may arise from the acts of unskilled or careless employees, or even the beekeeper's own children, the real responsibility can be more easily recognised.

It is suspected that a defect in electrical equipment caused the fire which destroyed this honey house.

Fire Danger

The causes and consequences of fires in beekeepers' honey houses in the past are sufficient justification for others taking every possible precaution which will prevent a fire, or its spread from the source before it becomes uncontrollable. Prevention and control are the cardinal rules.

Fire Prevention

Measures which embrace fire prevention are the use of fire resistant materials in the construction of buildings, spacing of buildings, and having all electrical, heating, and other mechanical equipment installed to comply with the electrical and wiring regulations or other authorities' requirements. These measures are fundamental and should not present any beekeeper with particular difficulty.

Experience has shown that the more serious fires have occurred in the honey houses constructed entirely of wood. The rapidity and fierceness of these fires were always aggravated by the flammable materials in the houses and destruction was usually complete or such that considerable reconstruction was necessary.

This circumstance and the ever-present fire risk in honey houses

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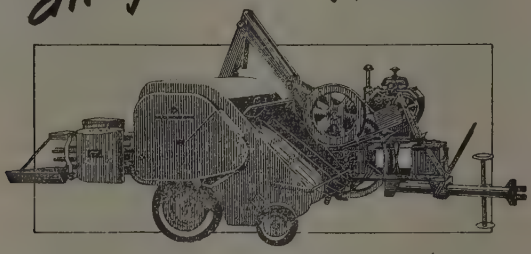

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emphasises the wisdom of building with brick or concrete. When a concrete floor and fire-proof linings are provided on the inner walls the part of the building most vulnerable to fire is the roof. However, a good roof constructed with a permanent material is capable of withstanding and restraining a fire for a considerable period before it will break down.

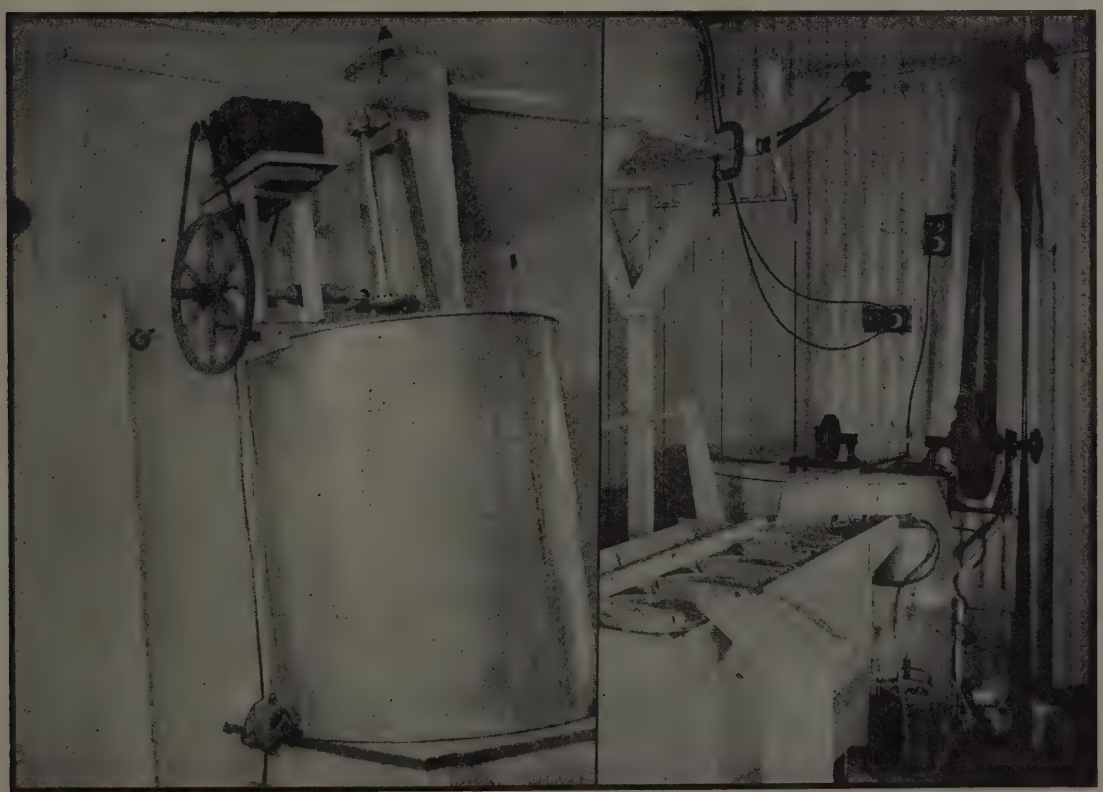
Roofing materials of the asphalt and rag-felt types should be avoided, as these readily ignite by exposure to heat and flying sparks. Once a roof is alight and the flames break through, the greatly increased ventilation which results makes the destruction of the building more rapid and the fire more difficult to control.

In many honey houses steam boilers and other fuel heating mediums necessitate the use of chimneys or chimney stacks. Chimneys are a dangerous source of fires, but with sound initial construction and correct maintenance this danger can be reduced. To reduce the danger of sparks and down draughts chimneys should extend at least 3ft. above a flat roof and 2ft. above the ridge of a hip roof. It is also important for flooring and surrounding woodwork to be constructed so that they are not in contact at any point with chimneys or flues and hearths.

Beeswax has always been an important by-product from the production of honey and over the years the methods used for rendering and pressing it have not changed to any great extent. This phase of a beekeeper's work has caused many serious honey house fires and for this reason a separate fire-proof building should be equipped and used solely for wax rendering. Where copper boilers are used for rendering beeswax they should be built in with brickwork to reduce the danger from spill-overs, which are not so likely to occur when the top surface surrounding the top of the boiler is dished downward toward the copper. A hearth sloping outward from a recessed fire-box is an added precaution, as any beeswax that spills or boils over is then not so likely to make contact with naked flames or hot ashes within the grate.

Beekeepers who manufacture their own hive parts should ensure that sawdust and wood shavings are not allowed to accumulate on floors around the saw benches. These materials are a fire danger, as they can be ignited in a moment through carelessness or an inadvertent mishap. The fine sawdust which lodges on the ledges of the workshop or within the motor of the saw bench and other electrical equipment should also be removed. This dust is readily ignited and the smouldering heat that it develops can travel rapidly and cause a major fire should it reach other

Steam boilers should be installed in separate fire-proof rooms of honey houses.



[*Photo at right by J. F. Louden*

Danger from unguarded honey house machinery. Left—A mechanical honey stirrer with uncovered moving parts mounted at head height beside a doorway. Loose clothing and the hair of women and girls could be caught up in the belt and serious injury could result. Right—A honey house extractor with unguarded pulleys and belts and an exposed fan at head height.

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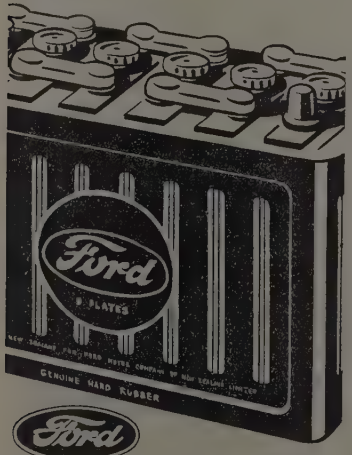

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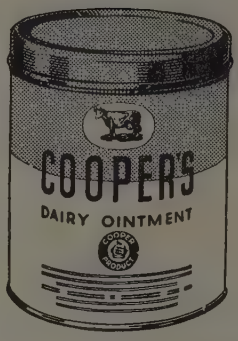

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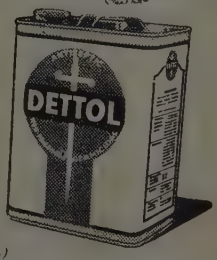

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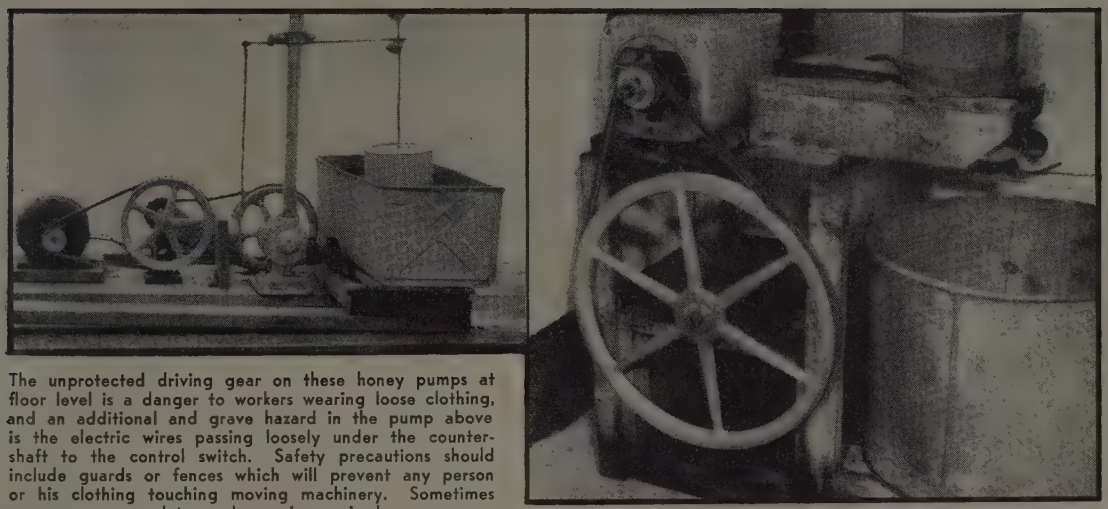


The unprotected driving gear on these honey pumps at floor level is a danger to workers wearing loose clothing, and an additional and grave hazard in the pump above is the electric wires passing loosely under the countershaft to the control switch. Safety precautions should include guards or fences which will prevent any person or his clothing touching moving machinery. Sometimes complete enclosure is required.

highly flammable material. Most beekeepers carry stocks of petrol and other fuel spirits and oils and paints. The fire risk with these is always very great and it is a wise precaution to provide a separate building for their storage.

The greatly increased use of electric motors and other electrical equipment in honey houses increases the hazard of fire, and every precaution is required with the installation of such equipment. Any deviation from the soundest principles governing the loading of circuits or equipment and essential electrical repairs is dangerous. All electrical installations have a limited capacity regulated by fuses designed to break the circuit immediately the maximum safe load has been exceeded. When fuses are used which permit the circuit to operate under overload the wiring, switches, and plugs can heat sufficiently to ignite their insulation materials and surroundings. Therefore, when new or additional plant is liable to build the load to exceed the rated capacity of the existing installation, the beekeeper should arrange for an alternative which will correctly cope with his new load requirements.

Electrically heated comb-warming rooms, electric ovens, and electric cappings reducers have come into popular use, and because of the nature of their heating and control equipment, special care must be taken to ensure that these are correctly installed and operated. Heater elements that are not separated from the wall or ceiling linings with fire-proof baffles are a definite fire hazard.

Because great reliance has to be placed on a thermostat control switch for the safe operation of these facilities, the efficiency of the switch is of paramount importance.

Thermostat switches designed to control temperatures in liquids should not be used to control air temperatures, as they can have a differential plus or minus varying as much as 30 degrees F. and would therefore be unsafe if used in that way. Thermostat switches specially designed for air-temperature control should be installed. Those having a range of adjustment between 70 to 190 degrees F. are most suitable for a hot room.

Thermostats functioning within the range of accuracy required by beekeepers should operate with a suitable type of relay switch to ensure their safe and efficient operation. Where the thermostat is wired direct into the circuit continuous arcing of the full current across the delicately adjusted contact points tends to destroy their sensitivity and reliability to cut out. When this arcing becomes excessive the switch contact points can weld together, and once this happens the current supply to the heating units is continuous and uncontrolled. In the past switch failure of this kind has caused fire with resulting serious loss. However, when the operating current to the thermostat is reduced by a relay switch arcing trouble is eliminated and under normal working conditions the thermostat can be relied on to give long and satisfactory service.

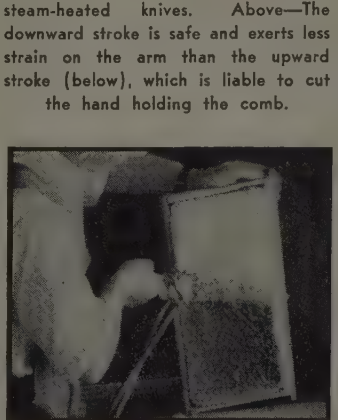
Fire Control

Though every precaution may have been taken to prevent fires, the risk of fires starting is too great for beekeepers to ignore the necessity for having efficient fire-fighting equipment immediately available in their honey houses and other buildings.

For ordinary combustibles water is the most effective extinguishing agent; therefore, an adequate supply is the first essential and the ideal arrangement is one where the water can be delivered under pressure. In rural districts a pressure supply can be readily developed by a gravity system or by pressure tanks. With water pressures of between 40lb. and 50lb. per square inch and a ½in. or ¾in. hose fitted with a ¼in. diameter nozzle a continuous jet of a sufficient volume of water can be delivered to fight incipient fires.

The 4-gallon bucket-type pump is also an effective unit for dealing with small fires. These pumps occupy very little space and as they can be easily

Two methods of uncapping honey with steam-heated knives. Above—The downward stroke is safe and exerts less strain on the arm than the upward stroke (below), which is liable to cut the hand holding the comb.



[*Green and Hahn*

carried to any fire, wherever it may be, at least one of them should be on hand at some strategic position for immediate use.

Electrical fires and ignited liquids such as oils, paints, and fuel spirits are best combated with an extinguisher containing either carbon tetrachloride or carbon dioxide (CO_2). Both of these chemicals are practically non-injurious to electrical equipment and being non-conductors of electricity are safe for the operator to use, whereas water is a dangerous conductor and is liable to float an ignited liquid from the seat of the fire over a wider area and cause further damage and make the fire more difficult to quell.

Machinery Dangers

Though many beekeepers do not consider that their machinery equipment is especially dangerous, accidents causing physical injury are not uncommon. The more serious injuries include severed fingers with saw-bench work, hands and fingers broken or crushed by moving extractor parts and other running machinery, and severe cuts from uncapping knives. Each of these and many other accidents which occur can be avoided if the beekeeper is constantly aware of the dangers of any machine or moving parts of a machine and observes common-sense safety practices and precautions.

Safety Precautions

Safety precautions include a system of guards or fencing which will prevent any part of a person or his clothing accidentally touching the moving machinery. Sometimes complete enclosure is required.

Shafting and pulleys and moving belts near floor level or slightly overhead are particularly dangerous, as loose clothing, aprons, or a ragged sleeve are always liable to be wrapped around a shaft or caught at the belt intakes. When moving parts cannot be completely enclosed care should be taken to ensure that they have no dangerous projections such as grub screws on shafts and badly fitted metal fasteners at the belt join, as these can inflict serious injury when inadvertently touched.

An even floor surface and ample working room are also important. The floor space adjacent to all machinery should be kept clear and free from spilt honey or other material which is liable to cause the operator to slip and be injured by the moving parts.

Commercial beekeepers use various types of saw benches for making hive parts, and the number of beekeepers with missing fingers is ample evidence of their danger. Circular saws under any circumstances are extremely dangerous and unless sound working methods are adopted a serious accident is inevitable. Saw-bench work of the type done by beekeepers is usually undertaken by trained or skilled operators, and beekeepers who are more or less self-taught should be specially careful to take no risks when using their benches.

Though it is impracticable to remove all the hazards associated with circular saws, safety guards should not be dispensed with on that account. Machinery inspectors insist that every saw bench should be fitted with a crown guard over the blade and a riving knife or spreader fin fitted as close as possible to the back of the saw blade, and the under side of the saw should be almost wholly encased.

During cutting each part of a saw blade is subject to an extremely rapid alternation of stresses. When these stresses are combined with those produced by centrifugal force they may cause the blade to fracture if the running speeds are too high. Cracked saws should not be used or repaired for use, as when they burst the fragments fly with such violence that the operator cannot escape serious injury.

For these same reasons "drunken" saws are not recommended. For rabbeting hive boxes and similar work beekeepers should use a combination set or a dado head.

When work is being done with a saw bench the operator's hands or fingers should be kept as far as possible from the saw blade, as the slightest miscalculation or slip will cause bad injury. For close work such as the cutting out of frame parts the risk can be reduced by utilising a push stick.

To allow the free use of both hands in working the bench, and to permit emergency stopping of the motor, a switch that can be turned off by knee pressure is a safety feature worth incorporating on all saw benches.

Sawdust that is allowed to accumulate and build up under the saw blade can become a danger, but attempts to clear or remove it while the saw is in motion are more dangerous still. Even when a scraper or a stick is used removal is not safe until the saw has been stopped.

There are many other types of risks, major and minor, which can confront a beekeeper in his occupation, but the remedy for avoiding likely accidents is in his own hands. The absence of safety features, including a properly equipped first aid cabinet, cannot always be attributed to the beekeeper's negligence or bravado as much as to his refusal to recognise that he is as liable to be injured as is anyone else. However, no human being can carry on indefinitely without making some mistakes and the severe injuries or loss possible through these errors are ample justification for incorporating the safeguards or precautions which will prevent accidents.

Trees Need Not Damage Vital Lines

"ELECTRIC power and telephone services were dislocated". How often does this statement appear in the newspapers after a storm? Why does the dislocation occur?

Many power and telephone failures are caused by broken branches and swaying trees damaging the lines during storms, and so these vital services often fail just when they are most needed. This causes great inconvenience and may result in financial loss, especially in country areas. There is also the cost of repairs, which the community generally has to meet.

For many years there has been a conflict of opinion about the growing of trees for shelter and beautification and their danger to power and telephone lines. Such conflict is really unnecessary, as most of the problems can be solved if a reasonable and co-operative attitude is adopted.

In most instances tree damage is avoidable, and property owners who have trees growing near power and telephone lines should **in their own interests** keep them trimmed well clear of the lines so that even in a high wind there is ample clearance.

Those intending to plant trees should remember to find out the best type for their purposes and then plant them so that they can grow and develop without having to be cut and trimmed to keep them clear of power and telephone lines.

Bulletins No. 271 "Farm Shelter" and No. 346 "Homestead Shelter Planting" are available free from offices of the Department of Agriculture.

A Children's Christmas Party

CHILDREN love a party. A Christmas party, whether it is on Christmas Day afternoon or at some more convenient time, can be as much fun for adults as it is for youngsters, provided that care has gone into its planning. Intelligent planning and early preparation contribute in no small measure to the success of any party and do much to prevent weariness, which mars many a hostess's pleasure. The excitement and delight of the children are more than adequate reward for the work involved in preparing the party, which to most children means the food. Simplicity should be the keynote in the fare, especially if the party follows a rich Christmas dinner. Given here by Betty Johnston, Field Officer in Rural Sociology, Department of Agriculture, Wellington, are some suggestions for planning a meal that is simple and yet colourful.

CHRISTMAS is a time of great delight for children. The traditional Christmas party centres round the tree, but the cake with candles, to be blown out with much ceremony and puffing, is one of the highlights. Most mothers try to include some plain food and this need not be dull, but can be as fanciful as imagination, ingenuity, and time will allow. The most satisfactory party tea is probably one which takes the form of an ordinary meal. Something savoury to start with, followed by a dessert, and finishing with cake and oddments of sweets and nuts or popcorn, which are the essential difference between party fare and ordinary food.

Allow plenty of time to prepare the food and for decorating the Christmas tree, the party rooms, and the tea table. Decorating the rooms and tree may be done 3 or 4 days before if the party is to be held at home, leaving ample time for making a cake, jellies, and the rest of the party food.

Holly, ivy, mistletoe, and fir are the traditional evergreens of Christmas, and to these New Zealand has added its crimson pohutukawa flowers. These and some crepe paper streamers, a few balloons, a paper lantern for the light, and silver tinsel stars for the tree make delightful, inexpensive decorations. The enlistment of several pairs of small, helping hands results in a lot of fun for the whole family.

The table should be gaily decorated to give a party air, and it need not be elaborately dressed or overladen with food. A cluster of brightly coloured balloons and bunches of holly or a miniature Christmas tree crowned with a star and surrounded with small lead or wooden animals of the Holy Land (see illustration on page 525) add an appropriate seasonal note. A coloured paper or plastic cloth with paper table napkins to match or contrast causes less anxiety than a linen table cloth. Paper table cloths can be made from 1 or 2 rolls of crepe paper by sewing strips of the required length together or by placing them side by side on the table. Squares of paper can be folded for the table napkins. The children are given a feeling of importance by the provision of place names for them all, and if this is done carefully, arguments will be avoided. Small cards with printed names decorated with a transfer or cut-out picture are easy to make. If there is time, more elaborate cards can be made. Pieces of stiff white paper with the names printed on them can be cut to the shape of sails and stuck with toothpicks into orange quarters (see the illustration on page 527). These look like small boats and can be made with apple quarters or small pieces of

Lower right—The Hansel and Gretel house is a novel idea for a party cake.

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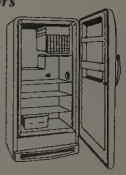
Refrigerators for the small family like this

5.5 cu. ft. model with large Super Freezer, "Quickube" ice tray, hydrator, cold control, "Meter-Miser".

Refrigerators for the larger family like this



7.9 cu. ft. model with large Super Freezer, separate meat compartment, door shelves, "Quickube" ice trays, hydrator, "Meter-Miser".

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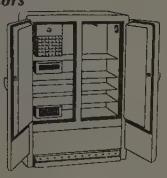

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banana if oranges are not available. A paper hat for each child completes the place setting. Small toys, painting books, crayons, whistles, or sweets wrapped in Christmas paper may be tied on to the tree and distributed to the small guests during the afternoon.

Planning the Menu

Most children are warned before they go to parties that bread and butter must come before cake. This advice, designed to prevent the children from making themselves sick with too much cake, will be blithely ignored unless the bread and butter shows some evidence of the party spirit. Hundreds-and-thousands or grated chocolate, universally popular with the young, give the correct festive look to plain bread.

Buttered toast with a topping of sweet corn is another favourite, but small children are apt to spill the corn unless it is firmly stuck to the toast.

Sandwiches cut into fancy shapes complete the savoury part of the tea.

The remainder of the meal may be more elaborate, depending on the time that is available for its preparation and whether or not the party follows Christmas dinner. If it does, a simple meal is all that is necessary. Sandwiches, jelly, and ice cream, with a Christmas cake and coloured fruit drinks, are sufficient, and most of them can be made a day or two before.

Few mothers have much spare time near Christmas Day, so the following menu suggests foods which look attractive and colourful, but which may be easily made in advance.

Menu

- Bread and butter and hundreds-and-thousands
- Club and fancy sandwiches
- Pikelet men
- Christmas cake
- Jelly rabbits in the garden
- Funny-face biscuits
- Prune mice and coloured fruit drinks
- Nuts and popcorn

It is usually possible to order bread to be cut for sandwiches. Wrap it in greaseproof paper or put it in a plastic bag and store it in a cool place, preferably a refrigerator. On the morning of the party butter the bread and make the sandwiches, but do not cut them until it is time to arrange them on plates. This allows them to set and they should hold together better than if they were cut immediately after making. The bread and sandwiches should be wrapped in separate parcels and stored in a cool place. Buttered bread will be easy to separate if the buttered faces are placed together. A hot knife run between any that stick will part them with very little difficulty.

Making the Sandwiches

The bread may be cut into fancy shapes with biscuit cutters and filled with wholesome fillings such as mashed egg, vegetable extract, honey, sweet corn, raisins, lettuce, or tomato. Children seldom like strong flavourings, and simple, well-known fillings are safest for a party. The unusual shapes will satisfy the children and transform the sandwiches, in their eyes, into something special.

Club sandwiches are made three or four layers thick, usually with brown bread alternated with white. Take a slice of brown bread and butter it on one side; then butter a slice of white bread on both sides. Butter a slice of brown bread on both sides, and, finally, butter a slice of white bread on one side only. Use three different fillings with these sandwiches. These should be generous and they should have a pleasing contrast of colour and flavour.

The measures given are standard measures and not household spoons, unless stated.

Suggested Filling Combinations

No. 1 Combination

a. Mashed and sieved green peas.

b. A thick roux sauce made with tomato soup or puree (the seeds and skins should first be removed).

c. Softened or grated cheese mixed with a little thick white sauce or cream. Thick slices of packaged cheese have an excellent colour and need no special preparation.

Below—A centrepiece for the party table.

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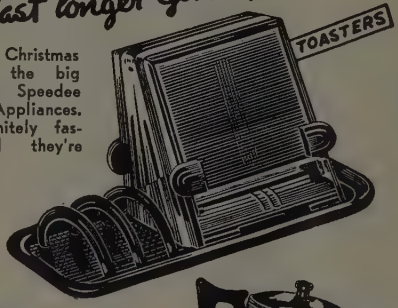

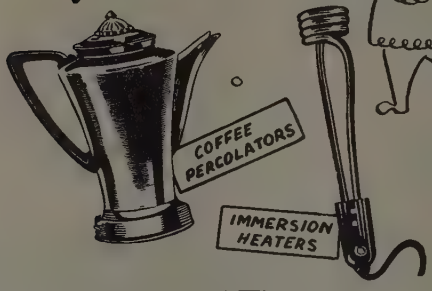

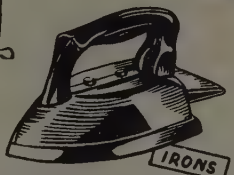

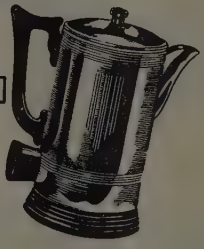

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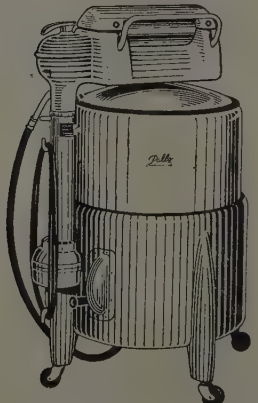

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Roux Sauce

4 tablespoons (or household dessertspoons) of flour
4 tablespoons (or household dessertspoons) of butter
½ teaspoon of salt
8 fl. oz. of tomato soup or puree of the same consistency

Melt the butter in a small saucepan. Stir in the flour to a smooth paste. Heat the mixture for a minute, remove the pan from the heat, and stir in about a third of the liquid. When it is smooth reheat it. Gradually stir in the remainder of the liquid and the salt. When the sauce has thickened store it in a small jar.

No. 2 Combination

a. Mashed egg mixed with softened butter, or creamed sweet corn with chopped bacon.
b. Thickly sliced, peeled tomatoes.
c. Shredded lettuce.

Creamed Sweet Corn and Bacon

2 rashers of lean bacon
Salt to taste
1 tin of creamed sweet corn

Chop the bacon into small pieces and gently fry it in a little butter in a saucepan. When it is crisp add the tin of sweet corn and heat it. If the mixture is too thin to spread easily in sandwiches, thicken it with a little cornflour mixed with milk. Season with a little salt. Pepper should not be added, as very few children like it. This filling may also be made a few days before it is used; but if the weather is hot, it should be stored in a refrigerator.

No. 3 Combination

a. Minced seedless raisins.
b. Grated apple or mashed banana mixed with a little lemon juice and honey.
c. A thick layer of peanut butter or apricot jam (or pulp).

Pikelet Men

An ordinary pikelet mixture is used, a teaspoon of it making the head, a dessertspoon the body, and a teaspoon 2 arms and legs. The girdle or heavy pan should be lightly and evenly greased. Too much butter on the pan will result in uneven browning. Drop the batter quickly on to the hot pan from the point of a spoon to ensure even shapes. When bubbles remain on the surfaces of the pikelet men turn them.

Standard cooking measures. In front, left to right—Heat-resistent glass measuring cup, plastic measuring spoons on ring (tablespoon, teaspoon, ½ teaspoon, ¼ teaspoon), graduated measuring cups (full (8oz.), ½, ¼, ⅛). At back—Beam balance and cook's metal measure.

Testing the Heat of the Pan

Drop ½ teaspoon of batter on the pan. If the butter is too cool, the top of the cooked batter will be dry and it will not brown when it is turned.

Pikelet Recipe

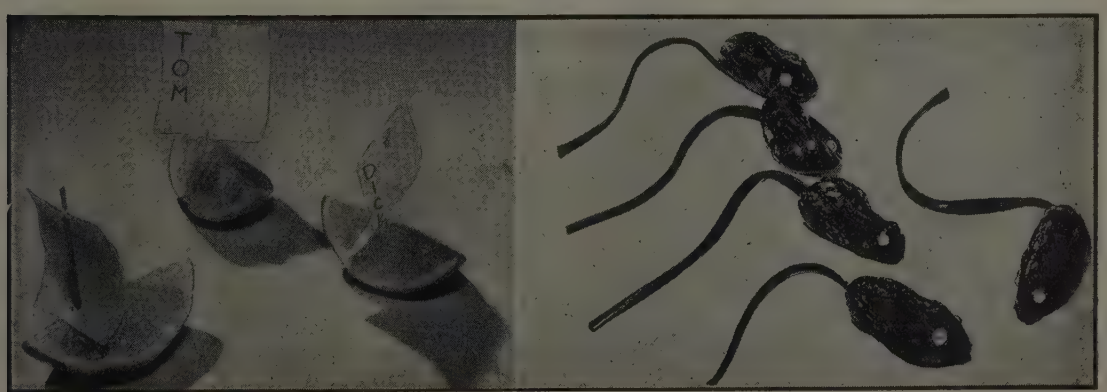
5oz. of sifted flour
1oz. of sugar
3 teaspoons of baking powder
½ teaspoon of salt
1 egg
6 fl. oz. of milk
½ teaspoon of butter

Sift the dry ingredients together. Combine the beaten egg, milk, and melted butter, and pour them into the centre of the dry ingredients. Stir the batter quickly until the flour is dampened. **Do not over-stir the mixture.** Drop the mixture quickly by spoonfuls as directed on to a hot girdle or pan and cook the men until they are a golden brown. This amount should yield about a dozen pikelet men. When they are cool make eyes, nose, and mouth with currants or snips of a jube, using a little butter as glue. Store them in an airtight tin.

Funny-face Biscuits

6oz. of sugar
6oz. of butter
8oz. of sifted flour
2 teaspoons of baking powder
½ teaspoon of salt
1 egg
½ teaspoon of vanilla
1 fl. oz. of milk

Cream the butter and sugar and add the beaten egg. Sift the dry ingredients together and add them alternately with the milk to the butter-sugar mixture. The dough may be rolled in greaseproof paper and stored in the refrigerator until it is used.



Left—Children's names may be printed on the sails of orange boats and the boats placed on the table to indicate individual positions. Right—Prune mice with silver cachou eyes and tails made from a liquorice strap.

Heat the oven to 400 degrees F. (a moderately hot oven). While the oven is heating either roll out the dough thinly and cut it into rounds or shape it into small balls. These are placed on cooking paper on an oven slide and pressed flat with a glass. Make eyes, nose, and mouth with currants, and use cornflakes for hair. Alternatively the features may be marked in with chocolate icing (use an icing forcer with a fine nozzle) after the baked biscuits have cooled.

Christmas Cake

Rich fruit cake is rather indigestible for young children, so instead make a plain butter cake and ice it to look like the Hansel and Gretel cottage illustrated on page 523. The cake is baked in a square tin and when cool it is cut in halves. One half is trimmed to make the sloping roof of the cottage, the two layers being stuck together with jam. The waste pieces of cake may be used for trifle. A thick butter icing coloured with red food colouring is used for the roof, white for the cottage walls, and chocolate icing for the windows and doors. A chocolate candy bar makes the chimney. An icing forcer is needed for the fine outlines and for making the climbing roses (green icing) on the walls, but most of the work is done with a spatula or knife. It is not necessary to make a very even finish, as a rough finish is more realistic. Cut jubes form the garden and gravel path and coconut coloured with green food colouring makes the grass. The fence is made of candles.

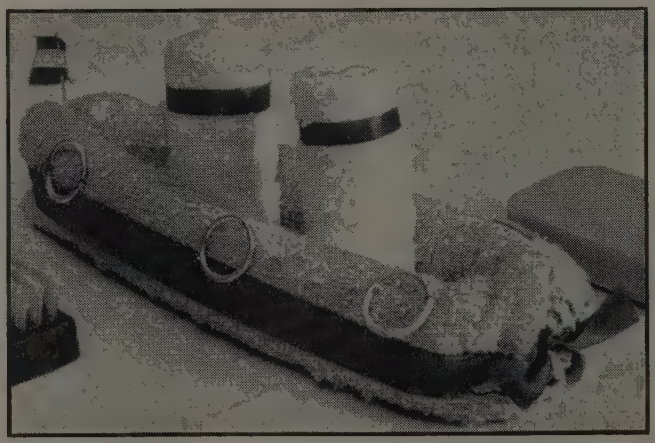
Cake Recipe

8oz. of butter
8oz. of sugar
4 eggs
1 teaspoon of vanilla
12oz. of sifted flour
4 teaspoons of baking powder
2 to 4 tablespoons of milk

Line a square cake tin (about 10in. x 10in.) with greased paper. Heat the oven to 340 degrees F. (a moderate oven). Sift the dry ingredients and weigh the sugar and butter. Beat the eggs.

Cream the butter and sugar and add the well-beaten eggs about a quarter at a time. Beat thoroughly, add the flavouring, and stir in the dry ingredients (but do not beat the mixture) alternating with the milk. It may be necessary to add a little more milk to make a sufficiently soft drop batter. Pour the mixture into the tin and bake it for 45 to 60 minutes.

A Gay, Useful Gift for Christmas Tree or Bazaar



THE small ship illustrated above is made in a few minutes from six face cloths or two face cloths and a guest towel or tea towels, six curtain rings, and a few scraps of ribbon.

Make two small rolls of newspaper about 2in. shorter than the length of the face cloths or width of the guest towel folded lengthwise. Roll each in two coloured face cloths and hold the rolls in place with a few pins or stitches. If a towel is used, double it, place a roll of paper at each end, and roll it up from each end to the middle of the towel. Hold it in place with a few stitches or join the rolls of face cloth at each end to form the sides of the ship. Fold two white face cloths in halves and roll them tightly to form the funnels. Pin or stitch each roll to hold it together.

A narrow band of coloured ribbon is then tied or stitched in place on each funnel about ½in. from the top. Place the funnels in position in the ship and anchor them with two or three stitches. Tie a band of contrasting ribbon around the ship and stitch a few small curtain rings around the edge for imitation fenders or portholes. A scrap of multi-coloured ribbon on a sharpened match stick will serve as a flag.

—EVELYN E. MOORE, Field Officer in Rural Sociology,
Department of Agriculture, Palmerston North

Prune Mice

To make prune mice large, juicy prunes, silver cachous, and a liquorice strap should be used. Remove the stones by slitting one side of the prune lengthwise. Pinch the prune so that it looks like the body of a mouse and use two silver cachous for eyes. A fine strip cut with scissors from a liquorice strap makes the tail. Prune mice are always a success with children.

Jelly Rabbits in the Garden

Individual plates of jelly for each child may be made the day before, final touches of ice cream being added just before they are served.

Make a green jelly as directed on the packet. Pour a thin layer of this jelly into each child's plate, shallow plates being the best to use. Make a red jelly and pour it into small rabbit moulds. If there are not enough of these to make one for each child, divide the jelly crystals and make one or two batches, carefully unmoulding the set rabbits on to the green jelly on the plates. Small mushroom sweets may be stuck into the jelly before it is served, and a garden of chocolate ice cream arranged in one corner will look most realistic if it is raked with a fork. This should please the heart of any child.

Drinks

Drinks will vary according to the ages of the children. For the very young milk is probably best, but older children will be delighted with coloured fruit juice or cordials, which are easy to mix.

An attractive idea is to frost the rims of the glasses by dipping them first into a saucer of neat cordial and then into a saucer of sugar. As the rims dry they appear to be covered with coloured frost.

Nuts, popcorn, and raisins are better for teeth than sweets, and many parents like their children to finish a meal with a piece of apple or celery. These could be put on the table as the meal finishes.

Work Planning

Where possible make the food and drinks a few days before the party. All of the foods described may be prepared in advance, though sandwiches are best made on the morning of the party. If the bread could be kept in a refrigerator, it could be buttered the previous afternoon. All the fillings may be made beforehand, but they must be kept in a cool place and covered to keep out flies and dust. Transparent cellulose jam covers serve this purpose satisfactorily.

The decorating should be finished and the children's clothes ready ironed and put aside, so that much of the last minute rush, almost inevitable on such an occasion, may be avoided. A fretted, tired mother is in no fit state to share in one of the most delightful of experiences with her children. Christmas is essentially a family feast and all the family, adults and children, should and most probably will be glad to share in the work involved in preparing for the party, making it, truly a time of joy and good will.

Making Vegetables Attractive

By DAPHNE EILERS, Field Officer in Rural Sociology, Department of Agriculture, Auckland

AT certain times of the year when there are only a few kinds of vegetables in season the housewife is faced with the problem of serving the same kinds frequently.

However, there is no need for the fare to become monotonous, as variety can always be attained by a little ingenuity in the method of cooking.

Here are two unusual ways of serving onions and carrots.

Onion Crisp

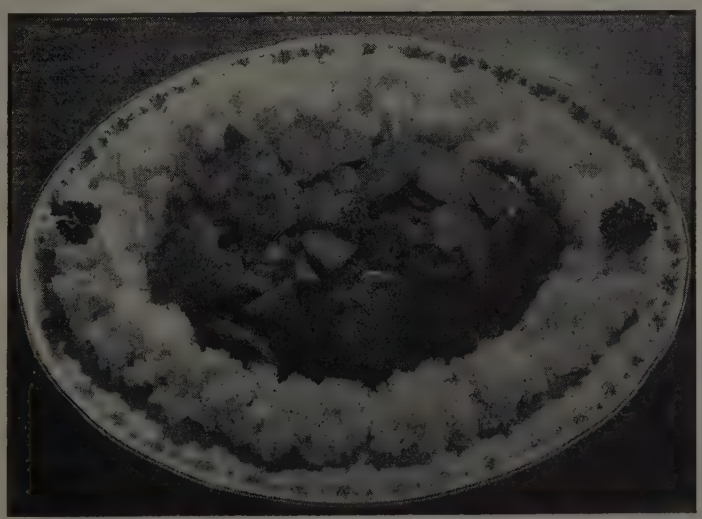
1 dozen small onions
½ pint of milk and water mixed
1 tablespoon of left-over peas or beans
½ teaspoon of salt
2oz. of butter
2oz. of flour
2 tablespoons of breadcrumbs
1 cup of onion liquor
A few walnuts

Peel the onions and boil them until tender in the milk and water to which the salt has been added. Place them in a greased pie dish and sprinkle the peas or beans over them. Make a thick sauce, using the butter, flour, and onion liquor; season to taste and pour over the vegetables. Sprinkle with breadcrumbs and chopped nuts. Place in a moderate oven (350 degrees F.) and bake for 15 minutes to 20 minutes until the breadcrumbs are crisp. (4 to 6 servings.)

Curried Carrots with Rice

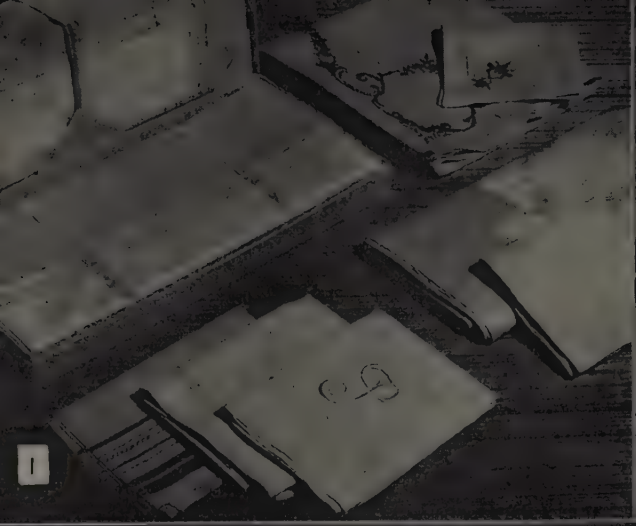
1oz. of dripping
1lb. of carrots
1 piece each of celery and turnip
1 small onion
2 teaspoons of curry powder
2 cups of hot, cooked rice
1 chopped apple
1 teaspoon of chutney
Salt and pepper to taste
½lb. of potatoes
1oz. of flour
1 pint of vegetable water, stock, or water

Prepare and slice the vegetables. Melt the dripping in a saucepan and saute the sliced carrots, celery, onion, and turnip for a few minutes. Add the curry powder and fry the mixture for a further few minutes. Then add the liquid, apple, and chutney with the salt and pepper. Bring to the boil, cover, and simmer gently for about ½ hour. Add the sliced potatoes and continue cooking the vegetables until they are tender. Mix the flour to a smooth paste with a little cold water and thicken the curry. Place in a hot dish, arrange the rice as a border, and serve very hot. (6 to 8 servings.)



HEADING PHOTOGRAPH: Onion crisp. Right—Curried carrots with rice. Photographs by Sparrow.

Fine Linens



1—Welcome additions to any collection of household linen. 2—Chinese handwork. Part of the design is cross-stitch worked in colours; the material is grass linen. 3—Irish linen damask tablecloth. 4—Chinese hand-worked handkerchief embroidered with shadow stitch pattern and drawn-thread work. 5—Exquisite Richelieu embroidered afternoon-tea cloth, a sample of Chinese handwork. 6—A hand-embroidered handkerchief-linen pillow case and an applique design on a grass linen table napkin.

Fine Linens Have Lustre and Durability

THE wearing qualities of linen are second to none in the natural fibres, and in the finer qualities the material has a lustre almost equal to that of silk. It is available in different weights and weaves, depending on use. In this article by Maud B. Strain, Field Officer in Rural Sociology, Department of Agriculture, Dunedin, linen is discussed from such aspects as kinds available, laundering and care, ironing, stain removal, and storage.

FIBRE obtained from the stem of the flax plant was probably the first textile used by man. Many Continental countries grow linen flax, from which the fibre is obtained by processes which are intricate and lengthy. In the manufacture of fine linens Ireland has always held supreme place. Spinning the fibre into yarn by machine presented difficulties because, though the fibre is strong, it is inelastic. Weaving also has problems due to the inelastic qualities of the fibre.

Even the plain square mesh requires endless care and precautions, but the fancy damasks are among the most intricate and difficult of the weaver's art. Apart from damasks the weaving of linen is very largely plain weave, the fabric depending, particularly in the finer weaves, on the inherent qualities of the fibre and its enduring good looks rather than on fancy weaves.

In plain weave there are approximately the same number of warp and weft threads, but there may be variations. Sometimes the warp threads are thicker than the weft threads; sometimes they are closer together. Sometimes the warp threads are "thrown to the surface" and sometimes the weft threads. (Threads thrown to the surface are those which appear in the pattern on the right side of the fabric.)

Damask is the patterned weave used for linen table cloths and napkins. It is a combination of satin and sateen weave. Satin weave is more or less a twill weave, but the points where warp and weft threads meet are kept as far apart as possible (this gives the smooth, shiny surface to satin) with the warp threads thrown to the surface. Sateen weave is similar, but with the weft threads on the surface. The jacquard weave is a combination of satin and sateen weaves and produces a patterned surface.

Damask may be square woven with an equal number of warp and weft threads per inch, over-wefted, with more weft threads than warp threads per inch, and under-wefted, with fewer weft threads than warp threads per inch.

Single and Double Damask

Double damask is a weave with weft threads passing over seven warp threads and under one warp thread to form the design on the right side, and with warp threads passing over seven and under one weft thread to make the background. The threads are therefore bound down, every eighth thread producing a loose enough weave to allow the cramming in of a greater proportion of weft threads to the inch. A high-quality double damask used to have 1½ times as many weft threads as warp threads, which resulted in a firm, fine cloth.

Single damask is a tighter weave, with weft threads passing over four and under one warp thread. Thus the threads are bound down every fifth thread to produce a tighter weave than in double damask and with less opportunity for over-wefting. Few single damasks are over-wefted more than 10 to 15 per cent. Most are approximately square; cheaper qualities may be under-wefted.

Double and single damask are merely names for methods of weaving and the term double damask, which used to indicate that the fabric was up to 50 per cent. over-wefted and finer and richer than was possible with single damask, has lost its significance. A single damask cloth at a comparable price will give equally as good wear, and a good single damask cloth is superior to a poor double damask cloth. If a double and a single damask, both the same price and in the same shop, are under consideration, the single damask would be the better purchase, but if at the same time a double damask of a much higher price were offering, probably the double damask would be one of the extremely fine cloths still made to the old high standards.

Attributes of Linen

Because of its length (the flax fibres are from 8in. to 4ft. long) and smoothness linen is lintless. A short fibre leaves minute ends protruding from the thread which, wearing loose, form lint and, as well as catching dirt particles, give a roughened appearance to the surface.

The smooth, lintless surface of linen gives up stains readily and offers little harbourage for germs and bacteria. This explains why supplies of clean, old linen are in demand for bandages and surgical dressings.

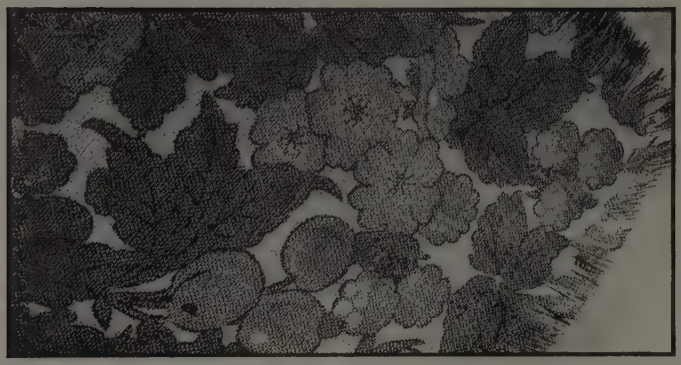
Though strong and durable, linen fibre is inelastic, and fabric made from it, not being springy, has a tendency to crease rapidly. This has been a disadvantage with it for outer wearing apparel. However, many dress and suiting linens are now being processed for crease resistance, and linens are manufactured that will resist and recover from creasing in a manner similar to silk and wool. Whether a material is crease resistant or not can be determined by crushing a portion of the fabric in the hand and noting the degree to which it smooths out. If it has been chemically processed for crease resistance, the fact is usually stamped along the selvedge.

Linen is the best conductor of heat and therefore the ideal choice for summer apparel, having the ability to look and feel cool on the hottest days.

Because moisture spreads through the meshes of linen fabric more readily than through cotton fabric, a quick method of identifying linen is to place a drop of water on it and note the almost instantaneous speed with which it is absorbed; cotton takes appreciably longer. Though moisture is readily soaked up by the linen fabric, it does not penetrate the fibre and evaporates again quickly. The linen articles in the wash are always the first dry. This characteristic makes linen the most desirable fibre for use as towelling and handkerchiefs, and at the same time explains why it is cold to wear next the skin.

The wearing qualities of linen are second to none in the natural fibres. The less linen is bleached the stronger it is, the so-called unbleached (really half-bleached) linens giving particularly long wear, and after a few launderings they become almost white. The pure white, fully bleached linens, though the most expensive, lose a slight degree of durability in bleaching.

Below—Three linens of different weights. The sturdier one at the top is suitable for curtains, loose covers, and other furnishings, the middle one is a dress linen, and the bottom fine-thread material is handkerchief linen.



Liberty linen in shades of blue on a white ground. This is a dress-weight linen.

Linen has a lustre in the finer qualities almost equal to that of silk. This greatly enhances its value for certain purposes as exemplified in the formal elegance of an exquisite damask table cloth.

Unlike wool and silk, linen is not affected by alkalis, except that soap with a lot of free caustic soda will, if used persistently, give a yellowish tinge to linen. Linen is susceptible to the action of even weak acids and it is for this reason that perspiration, being acidic, should not be allowed to remain in linen or cotton garments.

The difficulty of penetrating the fibres made the dyeing of linen somewhat of a problem. However, this has been overcome by the use of vat dyes, the most permanent of all fabric dyes. The name vat dye comes from the old-fashioned method of fermenting and steeping indigo in a vat. The same principle is used today, but the process is much shorter. When coloured linens are purchased it is advisable to look for and buy only those with a guaranteed fast colour label; without this the colour may prove disappointing.

When sheets, pillow-cases, or any other flat articles are being made it is wise to tear the material or to draw a thread to be sure of a perfectly straight edge.

Kinds Available

Linen is available in different weights and weaves, depending on use.

Embroidery linen is usually in a plain square weave with a dull finish designed as a background for various kinds of embroidery. Examples of this are seen in the beautiful Madeira handworked table and afternoon-tea cloths, and in the handwork displays at exhibitions and shows.

Handkerchief linens are plain weave and lightweight, and are used for infants' frocks, blouses, and lingerie, as well as for handkerchiefs. Some handkerchief linens are extremely fine and sheer.

Dress linens are for the most part medium weight and plain weave, though some finer and lighter weights are sometimes available for blouses and shirts.

Towelling linens are usually plain weave, as in tea towels, or pile weave, as in bath towels. All-linen bath towels are not readily available, but a linen-cotton mixture gives excellent wear. "Union linen" is a linen-cotton mixture. "Linene" is all cotton.

Damask is found chiefly in table linen, but the weave is also found in high-quality ticking for mattresses and in some upholstery linens. The printed linens are usually plain weave. There is no doubt that linen damask is still the best fabric for table covering because of its durability as well as its exceptional beauty when thus displayed. Some linen fibre is used in the manufacture of lace, but apart from this all linen fabrics are woven, unlike the other fibres which sometimes appear as knitted fabric.

Laundering and Care

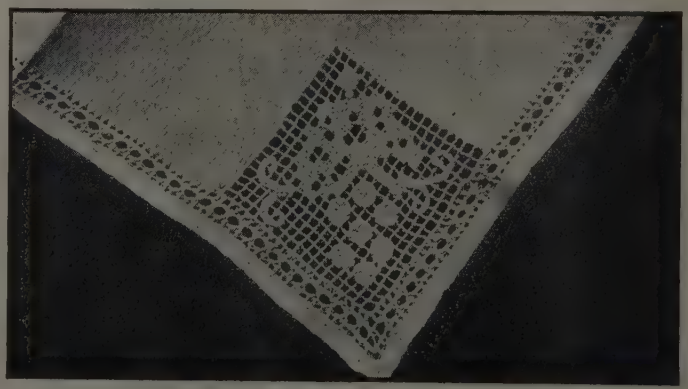
As has been pointed out, linen is a particularly durable fabric, but its durability can be greatly lessened by careless handling and laundering. Many breaks or apparent tears in linen yarns are actually cuts arising from careless or absent-minded markings on the table cloth with knife or fork, or from drying knives on tea towels, or razor-blades on bath towels. Though a cut may not be made at the time, the fabric is weakened so that a hole develops during laundering. Folds and creases will in time, if persisted in, cause breaks in linen cloth. In ironing, the folds should be made as straight and as few as possible, and some effort should be made to vary the arrangement, so that the strain of the fold does not always come in the same place.

Good-quality linen ironed damp does not require starching, but if starching is desired, it should not be too stiff, because such linen has a tendency to crack. Care must be taken in handling any linen that may have become frozen through being left out to bleach on the grass, because it may crack if creased.

Because washing soda, or other caustic solutions, used in boiling water is injurious to linen, a mild neutral soap should be chosen for laundering. The best way of laundering linen is with heavy suds made from neutral soap flushed through and through the fabric as in a washing machine, or a boiling for 5 minutes in fresh suds and then a thorough rinsing in two waters before the linen is blued. Should bleaching be necessary, the most satisfactory method is to dampen the fabric and hang it out in the sun or leave it out on a frosty night. White linens should be hung in the sun to dry, folded over the line, and pegged on the fold; table napkins and table cloths particularly should not be pegged by the corners.

Ironing

Linen should always be ironed damp; the heavier the linen is the damper it needs to be. A moderately hot iron should be used, but care must be taken, since linen scorches easily. If linen does become scorched, the mark should be washed and the material hung out wet in the sun or in night air. The lustre of linen is emphasised if it is ironed on both sides. First the wrong side should be ironed partly dry, and then the material should be turned to the right side and ironed until it is perfectly dry. This applies particularly to table linen.



Hand-embroidered filet lace corner of a natural-coloured linen table napkin.

Coloured Linen

For coloured linens a suds made from neutral soap and soft water is advisable, or one of the mild synthetic detergents is particularly suitable for coloured articles. The water should not be hot. No coloured fabrics should be permitted to become badly soiled before being laundered, because heavy soiling is more difficult to remove at the cooler temperature of the water.

Thorough rinsing is again very necessary.

Printed fabrics washed for the first time may lose some colour into the water and should be rinsed until the rinsing water remains clear; this removes excess colour, and subsequent washings can usually be done without encountering this difficulty. Only the colour-fast dyes are satisfactory with linens. However, with colours about which there may be any doubt, it is always advisable to test beforehand a sample piece of the material.

Ironing

Coloured linens should be ironed damp and on the wrong side only, except table linen where a gloss is desirable, in which case both sides are ironed.

Stain Removal

Stains of some types need removing before the article is laundered.

Ink pencil, grass stains, embroidery transfer ink, carbon paper, shellac varnishes, and ballpoint pen ink should be removed with methylated spirit, with subsequent washing to remove the last traces of the stain.

Lipstick usually comes out with washing; however, if it is known to be a type that does not, carbon tetrachloride followed by washing is usually successful.

Fruit juice, tea, and coffee stains, if attended to while fresh, can usually be removed by stretching the linen taut over a basin and pouring boiling water from a height (about 12in. so that the water strikes the fabric with some force) through the stain; if the stain is stubborn, a little glycerine put on it and the boiling water treatment again tried will usually be successful.

Butter, gravy, and olive oil stains are removed by ordinary washing processes.

Candle grease is removed by scraping off the wax, covering the spots both above and underneath with clean blotting paper, and pressing with a hot iron. Remaining traces can be removed with carbon tetrachloride.

Blood stains, particularly fresh ones, are removed by soaking them in cold water and subsequently washing the article; if the blood has dried, a preliminary soaking for a few hours in a weak salt solution, followed by washing in the ordinary way, is the proper treatment.

Mildew is always difficult to remove. The best method is as follows:—

Wash the article in a strong soap solution and put it wet out in the sun for several days, rewetting the fabric as it dries.

Iron mould is removed with salts of lemon. A little commercial salts of lemon is rubbed on to the wet stain and held in the steam coming from the spout of a boiling kettle; then rinsed out very thoroughly. For removal of iron mould with oxalic acid ½oz. of oxalic acid crystals are dissolved in 1 pint of warm water and the stain is immersed in this solution. The process is repeated if necessary, and the material is then rinsed out and washed in the usual way.

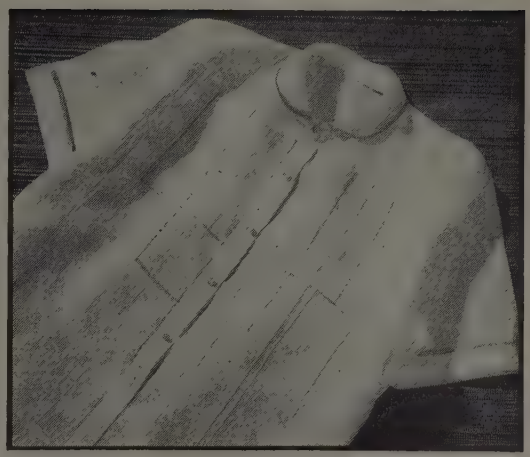
Salts of lemon and oxalic acid are both poisons.

Paint or varnish can usually be removed with turpentine, and lacquers with acetone, followed by the usual washing.

Storage

Any article which is usually starched but which is not likely to be used over a long period should be washed completely free of starch before it is stored.

Linen should not be kept in a cupboard through which heating pipes run, or in a chest near a radiator. Warmth is neither necessary nor advisable.



Hand-tucked and hemstitched handkerchief-linen blouse.

A dry, well ventilated cupboard with shelves 18in. to 20in. deep and covered with white paper, where linen may be piled, each kind separately, is the ideal.

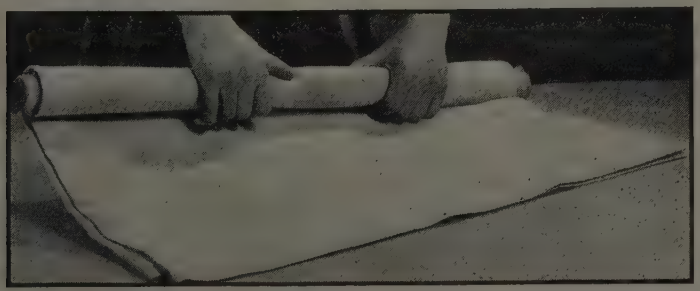
Table cloths are often rolled on the outside of a cardboard tube and tied in place lightly with tape. The cloth is folded only once, in halves lengthwise, and then rolled round the tube. Afternoon-tea cloths are treated similarly. Tray and wagon cloths, if space does not permit them to be stored flat without folding, may also be rolled. Napkins are folded and placed in a pile. Place mats are stored in sets with a piece of cardboard between one set and the next to avoid confusion. Dining room linen should be stored in the dining room, if space permits, to avoid extra steps, reserve supplies being kept in the storage cupboard.

Linen is moth-proof, but is particularly susceptible to mildew and should never be left dampened and rolled up for longer than a few hours before being ironed.

White linen not in general use should be covered with blue paper to guard against yellowing, and any that has yellowed through storage should be washed and hung in bright sunlight to bleach. Cedar chests are not suitable for linen storage; the fumes tend to yellow the material.

As good-quality linen is not inexpensive, it is advisable to replace each article or set of articles as it is withdrawn from use. If items are thus replaced gradually, the outlay is spread over a period and the supply is not depleted.

Ageing damask table cloths that have reached the stage where they can no longer serve their original purpose can be given a fresh lease of life as smaller breakfast cloths, table napkins, trolly covers, and carving and serving cloths. Old tea towels are excellent as polishing cloths for cleaning windows and they surpass any other material for cloths for washing paintwork.



Rolling an ironed table cloth round a cardboard cylinder or rolled-up newspaper will keep it free of creases while it is stored in the linen cupboard.

Tall-growing Annuals
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Summer Annuals for the Flower Garden

ANNUALS are among the easiest and most profitable plants to grow. Seed is cheap, easy to obtain, and not difficult to raise. Most annuals give a prolific flower crop, creating colourful garden effects, as well as providing ample flowers for cutting, especially during hot, dry summer weather. This article by M. Joanna Lockie, Horticultural Instructor, Department of Agriculture, Auckland, describes some of the uses of annuals. The flower garden notes for December are by the same author.

ANNUALS are plants which normally complete their life in one year; they grow, flower, and set seed all within the year from sowing.

There are other plants which do not complete their whole life cycle in one year, but which it is convenient to treat as annuals because of their habits; perhaps they flower in the first year from sowing or they are frost tender. Antirrhinums, bonfire salvias, and pansies are examples. Antirrhinums are perennials, but in the second year of flowering the bushes are straggly, woody, and hardly worth garden space, and the same applies to bonfire salvias when they are left to grow on, though they are really shrubs.

There are cases, too, where an annual has been made to live longer than a year simply by not allowing it to set seed. Such a plant does not last long or make much of a display, but it shows how the removal of spent flower heads keeps the plant flowering.

Annuals can be used in innumerable ways. They cover a wide range of colours, and vary in height, habit, shape, and form. It is surprising that greater advantage is not taken of the scope they offer.

The routine annuals, stocks, poppies, zinnias, and asters, are common enough and are used freely for flowers for cutting as well as garden display.

Dwarf plants growing 6in. to 8in. high, for example, alyssum, linum, and virginian stock, are ideal for growing as ground cover under shrubs, in the chinks between concrete blocks, or to cover up large expanses of newly dug land. Portulaca seed can be scattered over an area to go down in lawn, and will give a brilliant display. At the other extreme there are the annuals of 6ft. to 8ft. high, such as sunflowers, Mexican sunflowers, lavatera, and *Humea elegans* (incense plant), which can be used to give height at the back of a border or to make a temporary screen.

To give privacy or shade two climbers can be used, *Mina lobata* (*Quamoclit lobata*) and morning glory (*Ipomea tricolor*) Heavenly Blue. They can be run up over a wire fence or trellis; sweet peas can be used for this too.

In the wetter portions of the garden forget-me-nots will quickly naturalise, and there are several floriferous varieties, which continue flowering into early summer, in deep and pale blue and pink, far removed from the shy flowering plant which grows along the banks of watercourses. Cinerarias and *Primula malacoides* will soon naturalise in northern districts in damper areas of the garden, but in colder districts these will need to be transplanted every spring.

For hard, dry banks and borders portulaca, Livingstone daisies, ursinia, and dimorphotheca will all be perfectly happy.

Low-growing annuals will often grow in an exposed border where other plants will not. Newer or different kinds may be experimented with and grown in blocks or drifts. Group planting emphasises the individuality of the kind and drifts of annuals show up in the garden.

Some annuals which do better when sown in the positions in which they are to grow are larkspur, godetia, clarkia, mignonette, to mention a few, and it is possible to mingle drifts of these with shrub or bulb plantings.

The spider flower (*Cleome spinosa*) is well known now, with its pink heads and prominent stamens. When grown individually among other plants it has little effect, but it becomes a feature if it is grouped and six or more are in flower together.

Gilia, the Brazilian fire plant, is the same. It usually throws one tall spike about 3ft. clothed with delicate foliage and fine, red, tubular flowers. Individually, it is too fine and becomes lost among other plants, but a patch of them, planted about 6in. to 8in. apart, forming a light airy display of soft green and red, is really effective.

In favourable soils and mild climates group plantings may be left to reseed. This occurs readily with cleome, larkspurs, and nigella, perhaps because these plants seed easily and inconspicuously, without looking too untidy in the process.

To give privacy or shade the annual climber morning glory can be used.

TALLER PLANTS USED FOR BEDDING SCHEMES

		Flower colour	Habit of growth	Height
Amaranthus caudatus	Love-lies-bleeding	Red	Upright	2ft. to 3ft.
Antirrhinum	Tetra-snap types. Snapdragons	Varied	Upright	2ft. to 3ft.
Aster		Varied	Upright	2ft. to 3ft.
Calendula	Pot marigold. Radio, Lemon Queen	Yellow and orange	Bushy	2ft.
Celosia plumosa	Cockscomb	Scarlet, yellow	Upright	2ft.
Centaurea moschata	Sweet sultan	Lavenders, pink, and yellow	Upright	2ft.
Cheiranthus cheiri	Wallflower	Yellow and bronze	Bushy	1ft. to 1½ft.
Chrysanthemum coronarium	Golden Glory	Yellow and orange	Bushy	3ft. to 4ft.
Cleome spinosa	Spider flower	Pink	Spreading	3ft.
Gilia coronopifolia		Red	Upright	2ft. to 3ft.
Gilia capitata	Thimble flower	Blue	Upright	1½ft. to 2ft.
Petunia	Ruffled types	Varied	Spreading	1½ft. to 2ft.
Salpiglossis		Purples and golds	Upright	2ft. to 3ft.
Salvia farinacea		Blue	Bushy	2ft. to 3ft.
Salvia patens		Blue	Bushy	2ft. to 2½ft.
Salvia splendens	Bonfire	Scarlet	Bushy	2ft. to 3ft.
Stock, Brompton			Bushy	1½ft. to 2ft.
Stock, 10-week		Varied	Bushy	2ft. to 2½ft.
Tagetes erecta	African marigold	Yellows and bronze	Bushy	4ft. to 5ft.
Tagetes patula	French marigold	Yellows and bronze	Bushy	3ft. to 5ft.
Zinnia	Giant mammoth	Varied	Upright	3ft. to 4ft.

Illustrations opposite: 1—Schizanthus. 2—Mexican sunflower. 3—African marigold. 4—Bonfire salvia. 5—Spider flower. 6—Brompton stock. All photos by Douglas Elliott.

TALLER PLANTS SUITABLE FOR GROUP OR NATURALISED PLANTINGS

		Flower colour	Habit of growth	Height
Alonsoa warscewiczi		Scarlet	Bushy	1½ft. to 2ft.
Cineraria		Mauves and pinks, varied	Bushy	2ft.
Clarkia elegans		Pinks and white	Upright	2ft. to 3ft.
Cosmos		Pinks and white, varied	Bushy	3ft. to 6ft.
Godetia		Reds and pinks	Upright	2ft. to 3ft.
Helichrysum	Everlasting daisy	Red, pink, and yellow	Upright	3ft. to 4ft.
Humea elegans	Incense plant	Deep red	Upright	4ft. to 5ft.
Kochia trichophylla	Summer cypress	Green to red foliage	Bushy	2ft. to 3ft.
Larkspur		Blue and pink	Bushy	2ft. to 3ft.
Lavatera		Pink	Bushy	2ft. to 3ft.
Linaria	Toad flax	Varied	Upright	1ft. to 2ft.
Mignonette		Pale cream and green	Bushy	1½ft. to 2ft.
Molucella laevis	Shell flower. Molucca balm	Green	Bushy	2ft. to 3ft.
Nicotiana	Tobacco flowers	Varied	Upright	2ft. to 3ft.
Nigella	Love-in-a-mist	Blue	Bushy	2ft. to 3ft.
Scabiosa	Pincushion	Varied	Bushy	3ft. to 4ft.
Schizanthus	Poor-man's-orchid	Varied	Bushy	2ft. to 3ft.
Sunflower		Yellows	Upright	4ft. to 6ft.
Tithonia	Mexican sunflower	Orange	Bushy	5ft. to 6ft.

LOW-GROWING ANNUALS SUITABLE FOR EDGINGS OR MASSED PLANTINGS

		Flower colour	Habit of growth	Height
Ageratum	Blue Ball	Blue	Compact, bushy	6in. to 8in
	Blue Cap		Compact, bushy	
Anchusa	Blue Bird	Blue	Compact	15in.
Antirrhinum	Snapdragon, Tom Thumb varieties	Yellow, white	Compact, bushy	6in. to 8in.
Alyssum maritimum	Little Dorrit	White	Compact, bushy	4in.
	Lilac Queen	Mauve	Bushy	4in.
Begonia semperflorens	Fibrous-rooted begonia, Indian Maid	Bronze foliage, red flowers	Upright	8in.
	Empel	Light pink	Upright	12in. to 18in.
Centaurea cyanus	Cornflower	Blue, white, and pink	Upright	12in. to 18in.
Centaurea moschata	Sweet sultan	Pinks, mauve, and yellow	Upright	18in. to 24in.
Cheiranthus allioni	Siberian wall-flower	Bright yellow	Compact, bushy	12in.
Cheiranthus cheiri	Wallflower	Bronze and yellows	Compact, bushy	18in. to 24in.
Delphinium grandiflorum	Blue Butterfly	Deep blue	Compact	18in.
Dianthus chinensis heddewigi	Japanese pink	Reds and pinks	Upright	9in.
Dianthus heddewigi Giants	Fringed dianthus	Reds	Upright	9in.
Dimorphotheca aurantiaca		Orange	Upright	12in.
Iberis	Candytuft	Pinks and whites	Upright	9in.
Impatiens (frost tender)	Balsam	Pinks and white	Upright	18in. to 24in.
Linum		Red and various	Spreading	1ft. to 2ft.
Lobelia	Cambridge Blue	Blue	Compact	8in.
Myosotis alpestris	Forget-me-not	Dark blue	Compact	6in.
Mesembryanthemum	Livingstone daisy	Varied	Spreading	6in.
Nasturtium	Golden Gleam	Yellows, red, and golds		12in.
	Fire Gleam		Bushy	12in.
	Scarlet Gleam			12in.
Nemesia compacta	Blue Gem	Blue	Upright	9in.
Nemesia strumosa		Varied	Upright	12in.
Nemophila insignis		Blue	Spreading	9in.
Pansies		Varied	Spreading	6in.
Phacelia campanulata		Blue	Spreading	9in.
Phlox drummondi		Varied	Spreading	12in. to 18in.
Portulaca		Reds and yellows	Spreading	6in.
Petunia	Single bedding	Varied	Upright	12in. to 18in.
	Giants of California	Veined throat	Spreading	12in. to 18in.
Silene armeria		Deep pink	Bushy	12in.
Salvia	Rongatea Gem	Scarlet	Bushy	9in.
Sweet wivelsfield		Pinks	Upright	18in.
Ursinia anthemoides		Orange	Upright	12in.
Verbena		Reds, purples, and white	Spreading	8in. to 12in.
Viola		Purple, yellow, and white	Spreading	6in.
Virginian stock		Varied	Upright	3in. to 4in.
Viscaria		Varied	Erect	12in.
Tagetes		Yellows and bronze	Bushy	9in. to 12in.
Zinnia	Lilliput	Varied, pinks and creams	Bushy	8in.
	Magic Carpet	Bronze and yellow	Bushy	8in.

Forget-me-nots, primulas, and many other plants would seed readily if allowed to do so. Where the hoe is kept constantly moving through all borders there is little chance of any ripe seeds germinating, even if the seed heads are allowed to mature.

Bedding Displays

In contrast to the informal and group planting of annuals formal bedding designs may be used.

One bed or border is set aside for annuals and they are planted with precision in rows. Very good results may be achieved. One variety may be used or a design worked out using two or more kinds of plants; in such cases it is usual for taller plants to fill the centre or back of the bed and lower plants a border. Ideas for bedding specimens may be gained by watching effects in parks and reserves. The principal disadvantage is that the bed must be cleared after flowering and it looks rather bleak until the new plants have grown on.

Preparation of Bed

Beds for annuals should be worked up thoroughly to a good tilth. The soil can be improved by working in compost, decayed sawdust, seaweed, etc., but these materials should not be given too liberally unless they are thoroughly decomposed. A dressing of flower border fertiliser mixture made up of 3 parts of blood and bone, 2 parts of superphosphate, and 1 part of sulphate of potash may be given at 4oz. to the square yard.

If too much raw organic matter is dug in, the plants may receive a check due to starvation through a shortage of nitrogen caused by a temporary unbalance of the work of the nitrifying bacteria in the soil. This may be alleviated by adding dried blood or sulphate of ammonia at 2oz. per square yard or blood and bone at 4oz. per square yard.

Drainage should be good; waterlogged conditions may cause death of root hairs and slow up growth considerably.

Wet soil, especially in early stages of plant growth, usually renders plants more susceptible to collar rot and other fungous attacks. If the soil is wet, it is better to plant later when conditions are better. Soil should not be worked up while it is too wet, as it is liable to remain in hard lumps, which does not improve the tilth.

Planting

Raising of seed in boxes and open beds is described fully in the June and July 1954 issues of the "Journal of Agriculture".

Seedlings should be vigorous and well grown. Starved seedlings showing yellow foliage and stunted growth, or lanky plants, do not really give results to justify the after-care they need.

Healthy seedlings carry straight on to good growth and form better bushes and carry a greater amount of flower.

When planting out is done ample room should be allowed, because if plants are too crowded, they compete for light, air, and food and become weak and drawn and more susceptible to disease.

During planting, roots should not be allowed to dry out. A handy guide

for planting distance is the length of the trowel or its handle, which is about 8in.

The planting hole should be large enough to take the roots without cramping them. A trowel should be used for planting. Spindly annuals such as zinnias and antirrhinums may be set a little lower in the ground than they were in the seed box, but the heart or growing tip of a plant which grows in a rosette, for example, nemesia and forget-me-not, should not be covered with soil. If the soil is very dry before planting, fill each hole with water, allow it to drain for a minute or two, and plant in the wet soil. Firming has to be judged so as to leave the plant firm but not packed down, and the surface soil should be loose.

Windy weather during or just after planting is far harder on the plants than drought, and if the plants are tall, it may be necessary to support them, using short stakes or twiggy shrub growth, so that the roots will not work loose in the soil.

Maintenance

Light surface hoeing keeps down weeds and keeps the surface of the soil loose, which acts as a mulch to conserve moisture. However, hoeing should be shallow, as constant chipping away of the tips of surface feeding roots is not conducive to good growth. Hoe damage or even bruising to roots or stems may be sufficient to allow the entry of disease.

Light mulches of lawn clippings or well-decayed compost may be beneficial from late spring through summer in keeping roots cool and conserving moisture. Mulching material should be distributed evenly over the entire root area to a depth of about 1in. to 2in., but should not be heaped up round the stems of plants.

Manuring is not always necessary, especially on fertile soils or where the bed was thoroughly prepared before planting. Too rich feeding causes excessive leaf growth, making a large leafy bush with few flowers. Liquid manuring once the flower buds are developing increases flower production and flower size. Liquid manure should only be applied to damp ground and all fertiliser should be kept off the plant foliage because of the likelihood of burning; except, of course, in the case of foliar fertilisers.

Watering should be done when the soil dries out. A thorough watering every week, the water being allowed to soak down to the root area, is preferable to several sprinklings where only the surface is moistened. If only the surface is wet, feeding roots tend to come up to the damp soil and if, for any reason, watering cannot be continued, the plants suffer seriously.

Cutting Flowers for Indoors

Flowers should be cut with scissors or secateurs, because all cuts are clean and should heal readily, and as many plant stems are tough, tugging at them to pick the flowers loosens the whole plant and may even pull it out.

Cutting the flowers is important in the maintenance of annuals, as the more blooms are cut the greater is the over-all flower production. Once flowers fade and seeds set, flower production slows up and ceases. For a

Low-growing annual plants. Upper—Petunias. Inset—Sweet alyssum (Lilac Queen). Lower—*Ursinia anthemoides*. Douglas Elliott photo.

[*Douglas Elliott*

Cynoglossum amabile. Seed of this blue-flowered biennial may be sown now.

long display it is necessary to pick and keep picking. Even if flowers are not useful for decorative work, at least all spent flower heads should be removed and not allowed to set seed.

Saving Seed

Sometimes a particularly good strain of plant may be found and it is desired to save seeds.

Seed should be kept only from healthy true to type or superior plants to maintain the standards already achieved. Off-type plants having small flowers, poor growth habit, or a small flower production should be discarded. Plants of poor type will probably set a prolific crop of seeds, but plants grown from poor seed can never be improved however much attention and energy are put into caring for them. There is always the possibility of cross-pollination, which would result in wide variations in the resulting plants.

Seed to be saved should be left on the plant until it is nearly ripe. If it is cut too early, the seed is immature and may not grow. If the collecting is left too late, the pod may shatter as soon as it is touched, and the seed be lost.

Seed pods or stems should be hung over or laid on newspaper to dry, and once the seeds have dried they can be put away for storage.

Seed is alive, though dormant, and should be kept in a cool place. The container should be proof against mice and insects. Tobacco tins and various kitchen tins would be suitable.

All containers should be clearly labelled with the plant name and year. It may be thought possible to remember each year by painting the tins in different colours, but it is better to be sure and sow fresh seed. Old seed may germinate, but is not dependable, whereas a good strike usually will be gained with the fresh seed of most species.

Disease

Rotation of crops should be practised because of the build up and carry over of disease. This is especially important with asters, stocks, poppies, and petunias, which seldom give a good display the second year in the same bed.

Prevention of disease by attention to cultural details should be a guiding factor in planning and preparing for the planting of annuals and maintaining them. Well-grown plants are better able to withstand trouble. Though rank, lush growth, caused by overfeeding and too sheltered conditions, may look healthy, it is usually less able to withstand attack than hardier grown material.

Annuals, on the whole, are remarkably free from disease. Though they are troubled with virus, aphides, and thrips and suffer depredations from slugs, snails, and caterpillars, with reasonable care it is possible to garden for many years without having a serious setback.

Work for December

The Christmas rush is gaining momentum at this stage and the garden should be in such a state that work in it is reduced to a minimum.

Staking of dahlia, chrysanthemum, gladiolus, and any tall perennials should be brought up to date. Mulching materials around shrubs will probably need replenishing. Large additions of organic matter to a mulch should be made only when the soil is damp, but light replacements may be added at any time.

One good watering a week is better than splashes which just keep the dust down. Deep watering reaches the roots in the lower layers of soil, whereas light sprinklings moistening the top only encourage roots to rise in search of the water, and being nearer the surface, they suffer more if for any reason watering cannot be continued.

Annuals

Seed of aster, *Phlox drummondi*, zinnia, marigold, and petunia may still be sown for late summer display.

If planting of annuals has been neglected and plants are to be put in now, they must be planted in well-watered holes. Careful attention to planting, followed by regular watering, will be necessary to ensure good growth. Plants which will survive transplanting now are gilia, cleome, bonfire salvia, and petunia, and seed of portulaca and Livingstone daisy may be broadcast in dry borders. Seed of biennials, sweet william, wallflower, and *Cynoglossum amabile*, and many perennials may be sown now to grow on to give flowers next summer.

Removal of Spent Flowers

To keep the garden bright, spent flower heads should be removed regularly from annuals, cutting them in preference to pulling the old heads, as often the whole plant comes up with that treatment.

Removing old dahlia flowers keeps the bushes producing as well as making them look more attractive. Cutting away the top faded portion of Watsonia stems and delphiniums often induces small side buds to develop and form quite a good flowering stem.

Roses

As the main flowering season passes rose bushes should be looked over and all spent flowers removed. In removing spent flowers it is essential to cut back to a healthy bud. This reduces the likelihood of die-back entering the stem and the bud breaks away into active growth. Any blind shoots also should be removed, cutting the blind tip back to a healthy bud.

Climbing roses from now on develop long wands of succulent new growth. These growths will be required for next year's flowers and as they are brittle and liable to wind damage, they should be tied in. Rambling roses should be pruned immediately after flowering by the cutting out of old flowering stems from the base of the plant.

Wisterias

Wisterias also develop long rank growth during summer. On young plants these runners can be tied in place, when they will harden up in a year or two and form the basic framework to carry flowers and foliage. On old, large plants with dense growth long growths can be cut back to within six or so buds of the older wood. This will keep the wisteria more bushy and compact and often all the six buds will turn into flowering spurs.

Irises

Bearded iris can be lifted and divided and new plants put in now. Irises need a warm sunny situation to do well and can be given a dressing of lime at 4oz. per square yard every spring. When iris is planted the rhizome should not be covered with soil, but at least half of it should be left exposed on the surface.

Bulbs

Clumps of narcissi and daffodils which have increased and become too thickly matted may be lifted this month as soon as the foliage has withered and dried. For general garden display it is usually sufficient to lift narcissi once in 3 years and where the bulbs are naturalised in lawn or grass they may be left undisturbed for many years. Valuable narcissus bulbs left in the ground should be dusted every fortnight with 2 per cent. D.D.T. dust to protect them from bulb fly attack.

As lifting is carried out bulbs should be gathered. Leaving them exposed for several days increases the risk of the bulb fly laying its eggs among them and too long exposure to bright sunlight could cause scorching. Soft, rotten bulbs should be destroyed and plump healthy ones stored in a cool, dry, well-ventilated place until required for planting in February and March.

Quickly Prepared Dishes from Staple Foods

EVEN the best organised housewife is sometimes faced with an emergency, such as when a number of extra people arrive at a mealtime and must be fed. Sometimes the meal already prepared for the family can be stretched to provide for the visitors, but there are times when the meal is limited and there is no food or extras which can be readily added to it to make it go further. At such times the housewife thankfully turns to the pantry shelves and opens a tin of this or that and converts it into an appetising meal in a short time, or she reluctantly sacrifices the main ingredients for the next meal to meet the emergency. Eventually, however, she may have to make a meal from staple foods kept in the house, and in this article Nell Macpherson, formerly Field Officer in Rural Sociology, Department of Agriculture, Auckland, describes quick methods of preparing appetising dishes with such foods.

WITH no shops nearby and with weekly deliveries many country women keep a supply of such things as bacon, cheese, and cereal products (macaroni and spaghetti), and these with eggs, which are usually readily available, potatoes, and onions can form the basis of many main dishes.

Salad greens are usually obtainable from the garden, but if these are not quite ready, cabbage can be used to make a nice salad, and if it is served with a rich cheese dressing and crackers, it makes a very attractive main dish for lunch or tea.

Puddings are fairly easy to make quickly if there is a good supply of milk, and such dishes as junket, boiled custard, and blancmange are old favourites. However, there is sometimes a temporary shortage of milk, which means that other puddings which can be quickly prepared from staple foods must be made. Among these currant or date fritters and raisin pie are very acceptable. So, also, are pancakes and usually the visitors will be only too keen to help in the making of them.

Sometimes, too, one can be caught with nothing in the tins and a few tried recipes for quickly made snacks are an advantage at these times. Scones and pikelets are always a favourite, and girdle scones and oatcakes are very easily made and relished, particularly when hot.

All the recipes given here are made from cooking staples found in most homes.

Augmenting the Main Dish

Dumplings or Duff for Stew

1½ cups of flour
⅔ cup of milk
Salt to taste
2 teaspoons of baking powder

Sift the dry ingredients, pour the milk into a well in the centre of them, and mix the dough. Turn on to a floured board and knead lightly. Cut into eight dumplings and cook on top of a stew for 20 minutes.

If making duff, use only half the quantities and put the kneaded dough slightly flattened on top of the stew. Cook for 25 to 30 minutes with the lid on.

Curry Sauce

For adding to a stew or for using up cold meat and making it go further this recipe is very useful.

1 apple (peeled and chopped)
1 onion (peeled and chopped)
2 tablespoons of raisins
Juice of ½ lemon
1½ cups of stock (or water)
1oz. of dripping
½ teaspoon of salt
1oz. of flour
1 tablespoon of desiccated coconut (can be omitted)
1 tablespoon of curry powder (more if desired)
1 dessertspoon of plum jam

Brown the apple and onion in the dripping. Add the flour and curry

HEADING PHOTOGRAPH: Raisin pie is a welcome change and can be quickly made.

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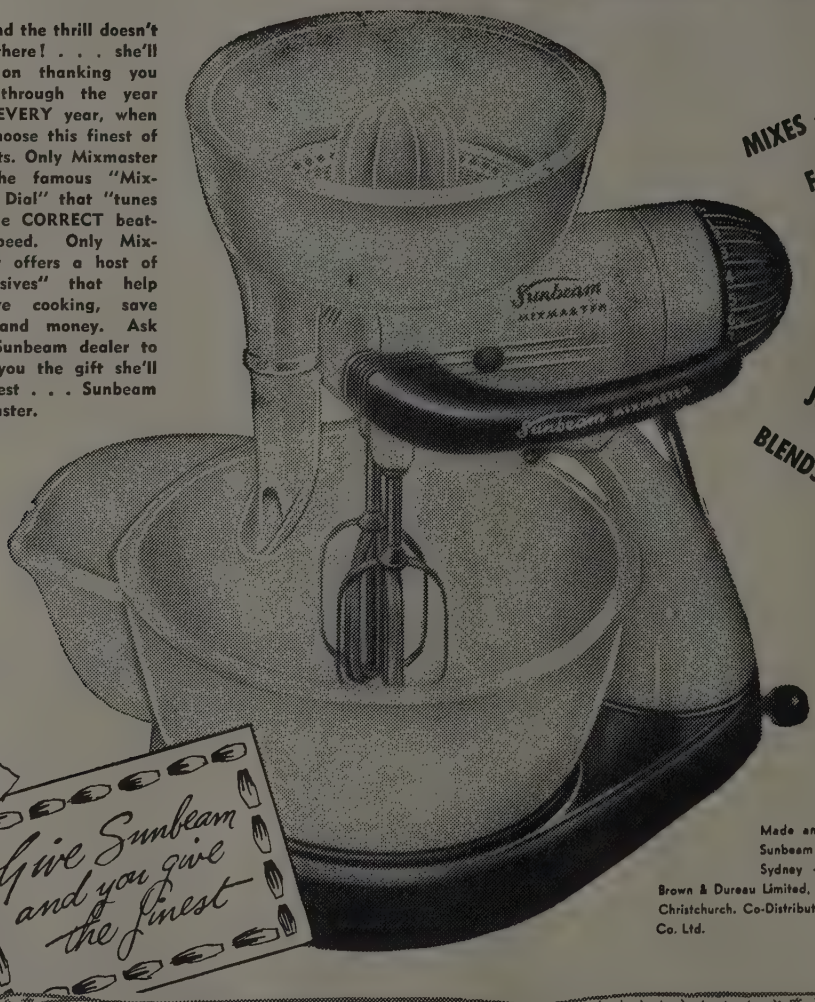

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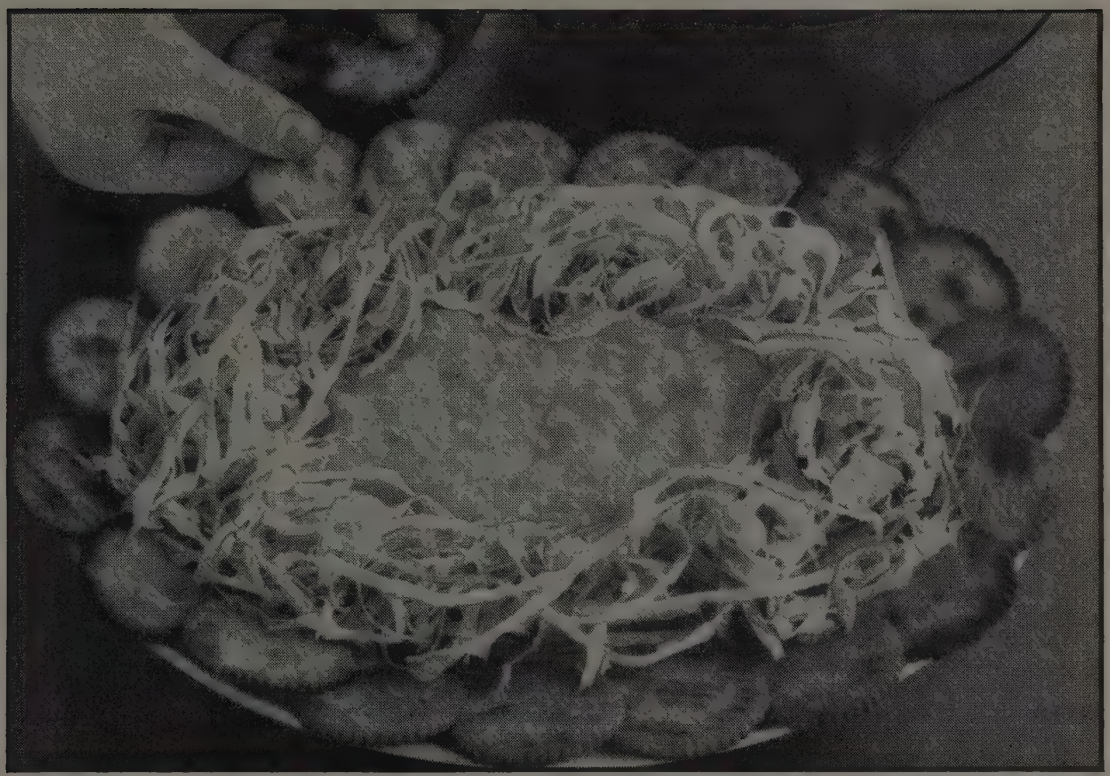

Cabbage salad with cheese dressing is delicious and is easily prepared.

powder and stir well. Gradually add the stock, stirring all the time. Heat to boiling point and add all the other ingredients. Cook for 20 to 30 minutes. If using up cold meat, cut it up and add it with the raisins and other ingredients.

Rice

Rice is usually served with curries, though mashed potatoes will do.

To cook rice wash and drain 1 cup of rice, then add it to 1½ cups of boiling water and cook for 30 to 40 minutes.

Spaghetti or Vermicelli Ring

Put 1 teaspoon of salt in 2 to 3 cups of boiling water, then add 4oz. of vermicelli or spaghetti. Cook with the lid off until the water has nearly evaporated. Strain the spaghetti or vermicelli and arrange it in a circle or as a border round an oval meat dish. Dish up a stew or brightly coloured vegetable into the centre. The total time of preparation should be 25 to 30 minutes.

Salads

Combine any selection of salad greens and serve it with dressing. Such salads can be used with cold meat.

Main Dishes

If a salad is to be used as the main dish, some food such as hard-boiled eggs should be added to it.

Egg Salad

For each person 1½ eggs should be used with any selection of salad greens and a dressing. Boil the eggs for 7 to 10 minutes. Drain off the boiling water and cover the eggs with cold water; then roll the eggs between the hands and peel off the shells. Arrange the eggs either sliced or halved on the salad. The total time for preparation should be 15 to 20 minutes.

Cabbage Salad with Cheese Dressing

Cut the hard ribs out of a cabbage and wash the leaves well. Shred finely and arrange round a dish.

Dressing (Thick)

1 pint of milk	6 tablespoons of flour
1 cup of grated cheese	Pinch of cayenne pepper
½ teaspoon of pepper	1 tablespoon of vinegar
1 teaspoon of salt	

Use sufficient milk to mix the flour, salt, pepper, and cayenne to a smooth paste. Heat the remainder of the milk to boiling point and add it to the cold paste. Return the mixture to the heat and cook it, stirring all the time until it starts to thicken. Add the grated cheese and stir until it melts. Stir in the vinegar. Pile the sauce into the centre of the dish of cabbage salad. Garnish with cracker biscuits if desired. The total time for preparation should be 20 minutes.

Spaghetti Special

8 large onions	1 cup of grated cheese
4 to 8 slices of bacon	1oz. of dripping
Tomatoes (as desired)	4oz. of spaghetti
Celery (if available)	
1 egg	

Peel and chop the onions. Melt the dripping in a deep pan and add the

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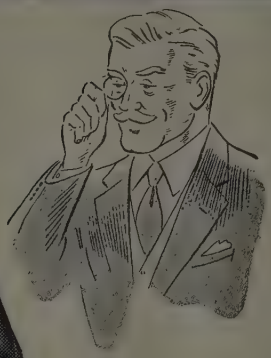

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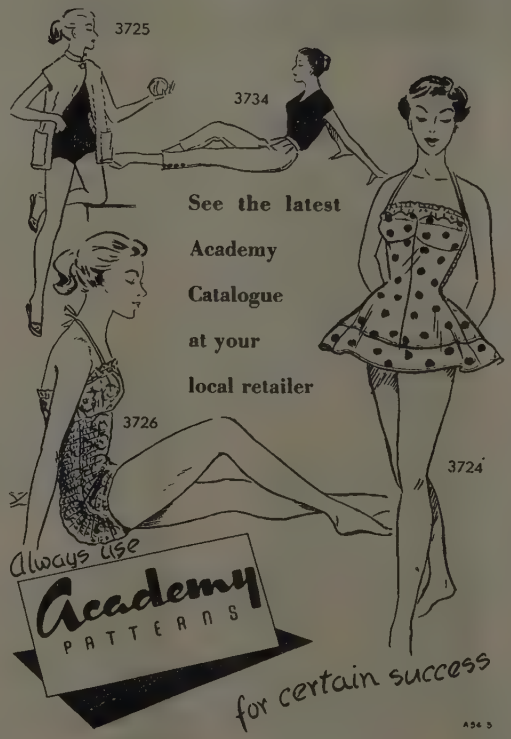

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onions. Cook over gentle heat. Trim the rind from the bacon and cut the bacon into short pieces. Add it to the onion. Just cover the mixture with water. Cook until the water has nearly evaporated. Put the spaghetti into boiling salted water and boil for 15 minutes. Hard boil the egg. Strain the spaghetti and add it to the bacon and onion mixture. Add the sliced tomatoes. Add the grated cheese and stir in well. Shell the egg, separate the yolk from the white, and chop both fairly coarsely. Dish the spaghetti mixture and arrange the egg as a garnish. This is sufficient for 8 servings. The total time for preparation should be 25 to 35 minutes.

Bacon and Egg Open Tart

Pastry

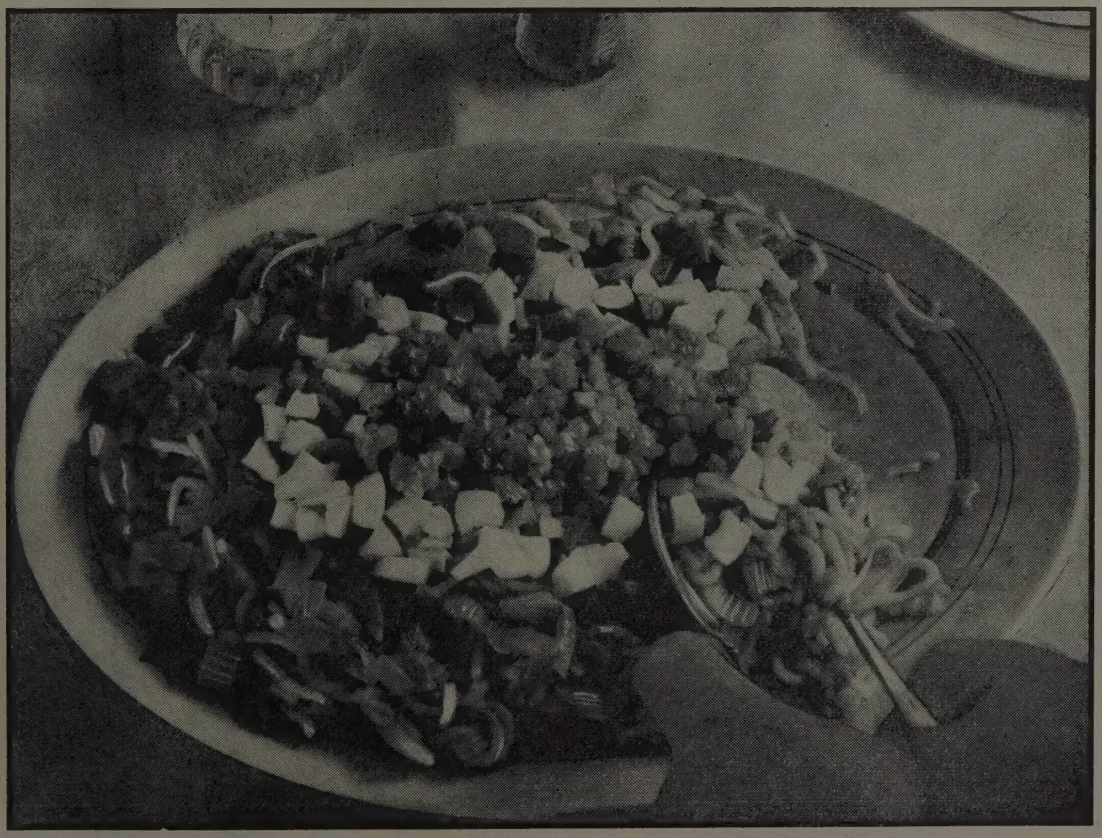
1½ cups of flour	½ cup of fat
¾ teaspoon of salt	Water

Filling

8 pieces of bacon (1 slice per person)	½ cup of milk
¼ teaspoon of pepper	4 eggs
	Chives

Rub the fat into the salt and flour until it is the texture of fine breadcrumbs. Mix with water to a stiff dough. Roll out the dough and line a square cake tin with it. Cut the bacon into sections and spread over the pastry. Bake at 400 degrees F. for 10 minutes. Meanwhile beat the milk, pepper, and eggs together. Pour this mixture over the bacon in the pie

Hot girdle scones served with jelly are an attractive snack for afternoon tea.



Spaghetti special makes a tasty main dish and can be prepared quickly.

shell and sprinkle the top with chopped chives. Bake for a further 10 minutes or until the egg sets. This is sufficient for 8 servings. The total time for preparation should be 30 minutes.

Stuffed Onions

8 large onions	1 cup of cooked meat pieces, or
1 cup of white sauce	½ cup of cooked bacon pieces, or
1 teaspoon of curry powder	1 cup of relish
1 teaspoon of Worcestershire sauce	

Peel the onions and boil them whole. While they are cooking prepare the white sauce with the following ingredients:—

3 tablespoons of butter	1 cup of milk
3 tablespoons of flour	1 teaspoon of salt

Use enough of the milk to mix the flour to a paste. Heat the remainder of the milk, the butter, and the salt, and when this mixture is just boiling pour it on the paste. Stir well and return to the heat. Bring to the boil and cook for 5 minutes. Allow to cool slightly and then fold in the other ingredients for the onion stuffing.

When the onions are cooked cut off the tops and scoop out most of the flesh. Add this to the white sauce mixture and pile the mixture back into the onion shells. Either serve immediately or sprinkle the tops with a little grated cheese and brown in the oven. The total time for preparation should be 30 to 40 minutes.

Puddings

Currant, Sultana, or Date Fritters

2 eggs	1 cup of flour
2/3 cup of milk	½ teaspoon of salt
1 teaspoon of baking powder	1 tablespoon of sugar
	Fruit

Sift the flour, sugar, salt, and baking powder into a basin. Beat the eggs in the milk and pour this mixture into the dry ingredients and mix well. Allow 1 dessertspoon of currants, sultanas, or chopped dates per person. Stir these into the batter. Allow the mixture to stand for 5 minutes. Drop spoonfuls in deep fat which is just beginning to smoke, and fry the fritters a golden brown. Drain them on crumpled paper. Serve them on a dish and sift icing sugar over them. The total time for preparation should be 30 minutes.

Raisin Pie

Pastry

1 cup of flour	½ cup of sugar
1 teaspoon of cake powder	½ cup of butter or lard
Milk to mix	

Sift the dry ingredients and rub in the fat. Mix with milk to a stiff paste. Roll the dough out to ¼in. thickness and line a pie plate. Bake for 12 to 15 minutes at 400 degrees F. Meanwhile prepare the filling as described below.

Filling

4oz. of raisins	1 tablespoon of cornflour
1 cup of boiling water	
Juice of 1 lemon	

Put the raisins in the boiling water in a saucepan. Cook for a few minutes until the fruit swells. Mix the cornflour to a paste with the lemon juice and extra water if necessary. Pour some of the hot fruit juice into the cold paste and mix. Pour this mixture into the hot mixture and cook, stirring constantly until it thickens. As soon as the shell is baked, pile the hot filling into it and keep the pudding hot until ready to serve. The total time for preparation should be 20 minutes.

Fruit Souffle

3 egg whites beaten stiff (Do not use duck eggs)	½ teaspoon of salt
	1 cup of fruit pulp
	1 tablespoon of lemon juice
½ cup of sugar	

Gradually beat the sugar and salt sifted together into the egg whites. Then beat in the lemon juice and the fruit pulp in the same way. Pile the mixture lightly on to a glass serving dish. The total time for preparation should be 10 minutes.

Snacks

Girdle Scones

2 cups of flour	½ teaspoon of salt
2 teaspoons of baking powder	Milk to mix

Sift the dry ingredients together. With a knife gradually mix in sufficient milk (about ¾ cup) to make a soft dough. Turn the dough out on to a floured board and knead lightly into a circle ⅜in. thick. Cut into 8 or 12 segments. Put these on to a hot, greased element or girdle and cook; turn after 3 to 4 minutes to cook the other side. Leave for 5 to 6 minutes. Total time 20 minutes. Serve hot, buttered or with jam and cream.

Oat Cakes

½lb. of flour	4oz. of butter or dripping
4oz. of oatmeal	
4oz. of sugar	1 teaspoon of baking powder
½ cup of milk	
½ teaspoon of salt	

Sift together the dry ingredients, except the oatmeal. Add the oatmeal, rub in the fat, and then stir in the milk. Turn the dough on to a board which has been dusted with oatmeal. Roll very thinly and cut in squares or triangles. Bake in a moderate oven for 8 to 12 minutes. The total time for preparation should be 20 to 30 minutes.

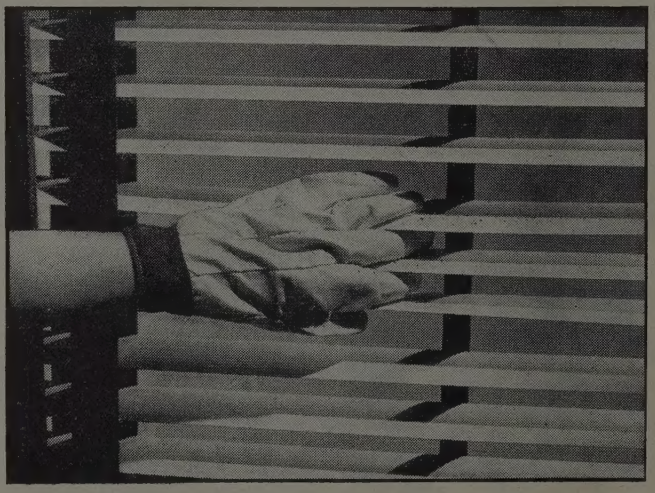
Spritz

1 cup of butter	2 cups of sifted flour
2/3 cup of sugar	1 teaspoon of almond essence
1 egg	

Cream the butter and sugar. Beat in the egg and essence. Sift the flour into the mixture and stir it in. Place teaspoonfuls on a greased tray and flatten the mounds with the bottom of a tumbler dipped in flour or sugar. Bake at 400 degrees F. for 7 to 10 minutes. The total time for preparation should be 20 to 30 minutes. This mixture makes 2 dozen biscuits.

All photographs by Sparrow.

Care of Venetian Blinds



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—MAUD B. STRAIN, Field Officer in Rural Sociology, Department of Agriculture, Dunedin

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